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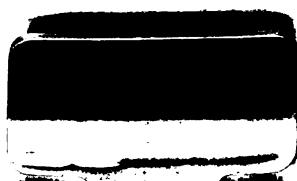
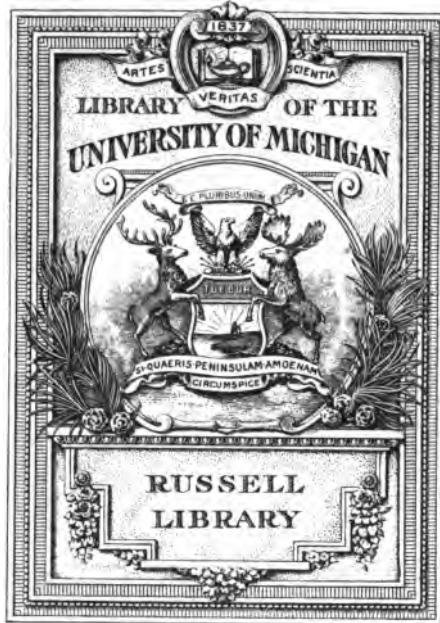
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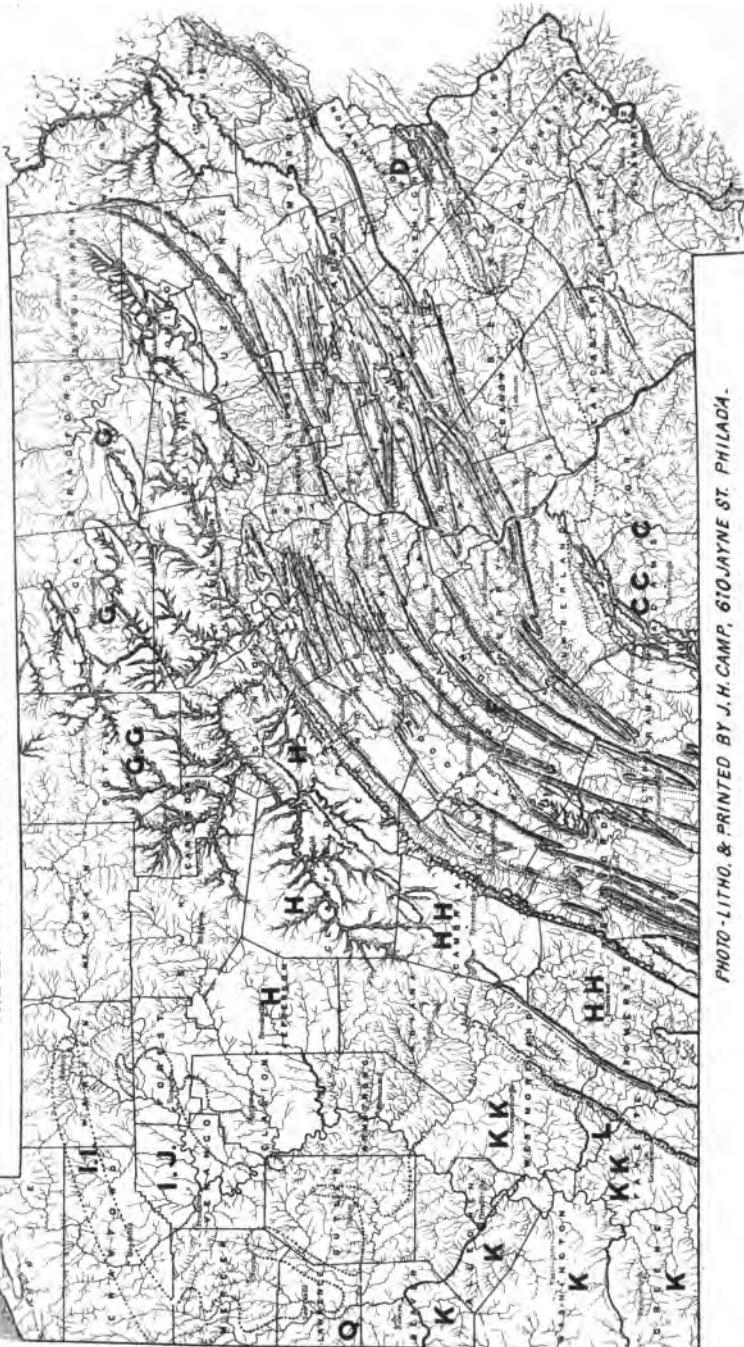


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SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA.

1875.

CC

REPORT OF PROGRESS

IN THE

COUNTIES

OF

YORK, ADAMS, CUMBERLAND AND FRANKLIN.

ILLUSTRATED

BY MAPS AND CROSS-SECTIONS SHOWING

THE MAGNETIC AND MICACEOUS ORE BELT

NEAR THE WESTERN EDGE OF THE

MESOZOIC SANDSTONE

AND THE TWO AZOIC SYSTEMS CONSTITUTING THE MASS OF THE

SOUTH MOUNTAINS.

WITH A PRELIMINARY DISCUSSION ON THE DILLSBURG ORE BED, AND A  
CATALOGUE OF SPECIMENS COLLECTED IN 1875.

BY

PERSIFOR FRAZER, JR.

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HARRISBURG:

PUBLISHED BY THE BOARD OF COMMISSIONERS  
FOR THE SECOND GEOLOGICAL SURVEY.

1877.

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REPORT OF PROGRESS  
IN  
YORK, ADAMS AND FRANKLIN COUNTIES,  
1875.

BY PERSIFOR FRAZER, JR., ASSISTANT GEOLOGIST.

CHAPTER VI.\*

*Examination of Properties South of Littlestown, near the Maryland Line.*

A number of trial shafts have been sunk on G. Kunkle's property, about 3 miles south of Littlestown. Some specimens showed the presence of brown iron oxide, but nowhere among the debris were there indications leading to a belief in any large quantity of ore. Two or three tons of black magnetic dirt are said to have been thrown up and carted away on the farm of Mr. Ephraim Myers.

On G. Baer's farm, half a mile from the Maryland line, there is seen an opening out of which has been taken a mass of ferruginous, or iron-stained, chlorite slates, resembling, to some extent, the Codorus ore, but poor in iron in the specimens observed.

In the adjoining farm of Mr. Willet is a small opening out of which has been taken a quantity of hard, compact chlorite rock similar to that of which an analysis is given on p. 106 of Report of Progress for 1874.

This rock is also said to contain a "native steel," but this statement is probably made for "native steel ore," since neither of the rival definitions of steel could be made to apply to the substance in question.

In a cut near Baer's farm this compact chlorite is seen to be dipping S.  $10^{\circ}$  W.— $89^{\circ}$ .

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\* Continuation of Chapter I of 1874.

In a cut 20 feet long on the property the following strata are recognized:

	Thickness.
Compact chlorite slate.....	5 feet.
Overlain by :	
Soft decomposed mass, stained red on weathered surfaces.....	5 feet.
Fine-grained green chlorite rock, intersected with quartz.....	5 feet.
Soft decomposed talcose and hydro-mica slate.....	5 feet.
Quartzite (at heading).....	?

All these chlorite rocks are rich in pyrite, and the slates in contact with them exhibit *cast* pseudomorphs of the crystals; but occasional streaks in the former rocks are much richer in pyrite than adjoining portions and as a general rule thin streaks are at or near lines of contact between the dark green chlorite slates and rocks of different constitution. This would appear to be an indication of a change of condition in the waters, culminating in the formation of pyrite, as that mineral is sometimes now found in swamps and bogs.

There seems every probability that in many cases at least the origin of the casts of pyrite was in the covering the exposed angles of already formed crystals by the mud from which the slates were formed, and their subsequent retention of the impression when hardened. If this view be correct, there must have been an exceedingly slow growth of the formations in question, which allowed the pyrite crystals to develop to considerable size, and during which the supply of iron to the sediment must have greatly decreased. Another oscillation of conditions in the then existing ocean not less important in the genesis of these rocks, was the deposit of large masses of quartzite among them in thin layers.

It has been previously stated that among the chlorite slates of the region south of Wrightsville quartzite was occasionally found to intrude.

Without further evidence in any special case, it will be impossible to assign any definite age to a quartzite as such. There seem to be several horizons in these rocks, at which quartzite beds of greater or less extent occur. A very thick bed underlies the slates and schists of the Wrightsville section, (Chicque's

rock, etc.,) and massive series are found intercalated with schist and orthofelsite in various localities of the South mountain.

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The following is an analysis by Mr. David M'Creath of two limonite ores obtained from localities described on pp. 37 and 39 of the report for 1874:

*Mickley's Bank.*

Iron sesqui-oxide.....	74.285	Metallic iron.....	52.00 pr ct.
Alumina.....	1.632		
Manganese sesqui-oxide,	3.900	Met. manganese..	2.716 pr ct.
Lime.....	0.340		
Magnesia.....	0.190		
Sulphuric acid.....	0.211	Sulphur.....	0.084 pr ct.
Phosphoric acid.....	0.948	Phosphorus.....	0.414 pr ct.
Water.....	12.140		
Insoluble residue.....	5.740		
Sum. ....	<hr/> 99.386		
Loss.....	<hr/> 0.614		
Total.....	<hr/> 100.000		

*Bauman's Bank.*

Iron sesqui-oxide.....	65.000	Metallic iron.....	45.50 pr ct.
Alumina.....	2.355		
Manganese sesqui-oxide,	1.712	Met. manganese..	1.192 pr ct.
Lime.....	0.390		
Magnesia.....	0.356		
Sulphuric acid.....	0.105	Sulphur.....	0.042 pr ct.
Phosphoric acid.....	3.295	Phosphorus .....	1.439 pr ct.
Water .....	11.790		
Insoluble residue.....	14.880		
Sum.....	<hr/> 99.883		
Loss.....	<hr/> 0.117		
Total.....	<hr/> 100.000		

NOTE.—These ores are from York county and on the Hanover range. Mickley's was taken from the bank about one mile northeast of Smith's station. Bauman's ore was obtained from a mine immediately alongside York Road station.

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The clay formed by the decomposition of the layers of slate is utilized for brick making in Mr. Barnetz's brickyard, about one mile from Hanover, on the line of the Hanover and Gettys-

burg railroad. About 3,000 to 4,000 bricks are made by hand per day. The clay is mixed with the red sand from the Mesozoic beds. About 100,000 bricks are averaged to the kilns, and two or three kilns are burnt in a season. The average market price is \$8 00 to \$10 00 per thousand.

The limestones near Hanover were made the subject of a second investigation.

One in a quarry about two miles N. by W. of Havover, dips S.  $30^{\circ}$  E.— $24^{\circ}$ . The color of this limestone is dark blue, streaked in all directions with calcite.

A dark slaty blue limestone (Roberts' farm?) with numerous calcite streaks occurs in a field near the New Oxford road, about 1 mile from Hanover, dips S.  $20^{\circ}$  E.— $28^{\circ}$ . It occurs in flags of about  $1\frac{1}{2}$  inches in thickness.

## CHAPTER VII.

### *General Scope of the Operations of the Party of York and Adams during the Season of 1875.*

The operations of the party of the district of York and Adams counties for the season of 1875 were mainly directed to a belt of country covering the contact of the South Mountain Rocks and the Mesozoic Sandstones on its south-east slopes. In a few instances lines of section were projected through the entire range of the South mountain to the limestone of the Cumberland Valley, but it was not attempted to include in the report the entire topography of the range from Dillsburg to the Maryland line. This is a work of great magnitude and difficulty, and a long time will be required to accomplish it.

Besides this, lines were run from York to Dillsburg, (along with an independent line of levels over the same route,) and from Littlestown through Gettysburg to Graffenburg, in the South mountain, thus connecting the work of the two seasons at both extremities, and providing a basis on which to construct topographical maps of these and adjoining counties.

A contoured map of 156 square miles, about the Stevens property, on the Gettysburg-Chambersburg pike, is expected to accompany next year's report.

The line from York to Dillsburg is intended, so far as possible, to present the different features of the various layers of the Mesozoic Sandstone in the manner of a section, though from the fact that the direction of the inclination of the strata differs from the direction of the line in some places, special methods were required in order to meet the difficulty. In the case of the line carried from Gettysburg through the South mountain, along the Chambersburg turnpike, to Greenwood, it would have been very interesting to note on the same section

line the different attitudes of the different formations by projecting the sections of their strata on the same vertical plane, but the difference of direction of dip is so material between the upper layers of the Mesozoic and the eastern outcrops of the South mountain rocks that to prolong the line through the mountain successive offsets, of a couple of miles each, in the direction of the prevailing dip, were drawn across the line of the turnpike. Thus the single section line was broken up into several portions each of which was carried down bodily to the south, so that its middle point corresponded with its intersection with the turnpike, thus forming a series of lines in echelon. But the great difficulty which was experienced in constructing the structure of the South mountain lay in the rarity of rock in place in accessible portions of the chain.

The region traversed by the Chambersburg turnpike is exceptionally poor in reliable exposures, though owing to the breadth of the chain at this point, (some nine miles,) and the existence of a rough sketch map containing studies of the vicinity made by Prof. Lesley some few years ago, it was selected as the most favorable spot to make the beginning of the final contoured map of the South Mountain chain, south of the Susquehanna river.

## CHAPTER VIII.

*The Dillsburg Group of Mines.*

The first mines to be described are those in the vicinity of Dillsburg, and about two miles from the boundary of the South Mountain series, and within the Mesozoic formation.

About three-fourths of a mile due east of Dillsburg occurs a group of iron mines which for some time past have claimed the attention of iron masters on account of the richness of the ore which they furnish. This ore will be elsewhere especially adverted to. It is essentially of the same kind in a large number of ore banks in this vicinity, and is generally known as the "Dillsburg Ore." The first and largest of these banks to be described, is known as—

*The Underwood Mine.*

This is represented on the map as the mouth of a slope.

The *Underwood Mine* (*XIII*, 5, No. 124) was formerly known as the Mumper mine, and was opened 27 to 28 years ago. Since 1868 it has been the property of Mr. Alexander Underwood, of Mechanicsburg, who first leased it for eighteen months to the Wrightsville Iron Company, and since the expiration of this lease has wrought it himself.

The mine is operated through a slope which enters the surface in conformity with the strata of the Mesozoic series, and sinks due north at an angle of  $28^{\circ}$  for 290 feet. Ore was not followed, however, from the surface, but a slope was followed till it reached a depth of 26 feet, when a body of eighteen feet of ore was found which dips more steeply as it sinks to the north. Eight drifts have been driven east and west of the slope at different levels. The average length of these drifts is 70 feet. The ore is blasted out as solid rock. The general dip of foot and hanging walls is the same as that of the slope. The foot wall is

a sandstone intermixed with limestone. The hanging wall is a trap. The distance between foot and hanging walls averages five feet, but Mr. Underwood states that ore has been found in the vein from 6 to 30 feet thick. Each drift is furnished with a railroad. Three shafts have been sunk to connect with the underground workings. The vertical depth of the lowest level is 140 feet, according to the statement of Mr. Underwood. (The angle of inclination observed near the surface and length of slope would give this depth as 98.12 feet).

Forty tons of ore are extracted daily. The daily average of the mine for the last two years is 30 tons.

The drifts were as follows:

The first at 120 feet down the slope from the engine house, and is driven horizontal and at right angles in both directions from the same.

The second drift is driven in the same manner at 180 feet down the slope.

The third is driven at 280 feet.

The first level is 100 feet to each heading from slope, and at every 20 feet intermediate between these points slopes have been commenced parallel to the main slope.

The second levels were 90 feet in each direction from the main slopes, and the parallel slopes were 4 in each.

In the lowest level the eastern gallery is 110 feet long, and the ore on the side of the main slope, and between this and the second level, has been taken out. The western gallery of the lowest level is 120 feet long, and contained six slopes upwards. The ore in a westwardly direction connects with the fourth slope in the second level.

The sixth slope ends on the line of the second level, and ten feet west of the heading. The fifth continues upwards and connects with the first level.

The ore is shipped from Dillsburg station and hauled there by teams owned by private parties, at a contract price of 30 cents per ton. The ore is used at the Pennsylvania Steel Works, the Lochiel Iron Works and the Marshall Furnace, Newport, Perry county.

About 30 men are employed—27 inside and 3 or 4 outside. The wages to miners and outside laborers are \$1 25 per day of

ten hours. The engineer obtains \$45 per month and the foreman \$80 per month. The engine is of twelve horse power. The fuel is anthracite coal and is consumed at the rate of  $4\frac{1}{2}$  tons per month. The water for the boiler is taken from the mine, and is more than sufficient, since no washing of the ore is necessary.

The pump shaft is 240 feet long, and the pump is worked about two-thirds of the time. The property contains about 240 acres. This pump shaft was sunk 28 feet to ore and 21 feet through ore, and connects with the main slope, and also stopes wrought east and west 150 feet, and north on the slope 100 feet. The ore has recently become very hard. Perhaps 10,000 tons have been taken out of the slope and shaft. Very little crystallized magnetite occurs. The average dip of the foot and hanging walls of the ore and of the trap at this locality is N.— $28^{\circ}$ .

A hearsay statement of a vertical section of fifty feet, through the strata near the old mine, was said to give:

	Feet.
Soil .....	14'
Hard blue altered rock.....	12'
Gray.....ditto.....	3'
Ore.....	21'
	<i>Unknown.</i>

This section is very unreliable.

*Underwood's New Opening. (XVII, No. 124 a.)*

A little over 200 feet south of the mouth of the slope are two excavations of irregular shape, one covering 10,000 and the other about 3,300 square feet. The first of these excavations is about fifteen feet deep, and contains a shaft (the "derrick shaft") which was sunk two years ago about twenty-five feet through trap, and twenty-eight feet below this through ore, the latter not having been penetrated. (Note.—Another statement makes this twenty feet of trap and twenty feet of ore.)

From the base of this shaft is a level east and west 110 feet in ore, and a slope 50 feet long dipping gently north. About six tons of ore were procured daily from this shaft. Three men were employed, and the machinery is operated by the engine of the older mine (the slope.) The cars are run from the drifts to the bottom of the shaft, and are thence lifted on the hoisting truck.

A layer of limestone was passed through. The dip of the strata was not obtainable with certainty, the most probable data being N.  $10^{\circ}$ , E.— $40^{\circ}$ .

The ore from this shaft needs no washing.

The excavation in which the "new opening" was made is really the first one in the region in which ore was discovered.

About 70 feet south of the derrick shaft is a second shaft 12 feet deep, of which 2 feet were said by Mr. Letcher, the foreman, to have been through trap and 10 feet through ore.

From the bottom of this shaft a slope was opened through ore to the derrick shaft.

About 100 feet east  $20^{\circ}$  north of the derrick shaft a new shaft has been sunk, of which the record is similar to that of the derrick shaft.

From the north-east angle of the derrick shaft a drift has been run 160 feet north-east. They stope out 40 feet of ore all the way along this drift. From the north-west corner of the new shaft another drift was run 40 feet, which met the first drift at that distance. This was also through ore. (The above statements are from Mr. Letcher.)

Twenty feet south of derrick shaft is a heading about west 60 feet; 15 feet north-west from the new shaft, cross-headings 10 feet in each direction, have been cut, which will connect with headings from the other drift.

A vertical section of the rocks from the surface gave

	Feet.
Soil and gravel .....	30'
Ore deposit ..... Thickness not known ??	

This is a statement of Mr. Underwood, and refers to the new openings.

Another large excavation immediately south-west of the last simply exhausted a large nest of surface ore. The amount taken out is said to have been probably as much as 5,000 tons.

300 feet east of south of the two excavations last mentioned is another pit, covering about 3,500 square feet, also made by Mr. Underwood. It was a small opening made by Abraham Mumper in 1862. It had caved in, and no data were obtainable from it.

*Logan's Mine.\* (XVII, 8 No. 122).*

This mine, which has been leased by Mr. H. M'Cormick & Co., of Harrisburg, lies 500 feet N. of E. of the Underwood slope. It was opened in 1874 by Mr. Logan, of Dillsburg. The shaft is fifty feet deep, and is cribbed for most of the distance. The direction of the slope at the bottom of the shaft is due north at an angle of about  $28^{\circ}$ , and is 80 feet long. This mine is wrought by day and night shifts of ten hours. At present the average yield is about 25 tons per day. The ore is hauled at 35 cents per ton by private teams to Dillsburg, a distance of about  $1\frac{1}{2}$  miles, 4 to 6 tons constituting a load. The ore is used by Mr. M'Cormick in his own furnaces. Twenty-one men are employed—2 engineers, 14 miners, and 5 outside men. Wages, \$1 10 to \$1 75 per day; engineer, \$45 per month; foreman, \$75 per month. The engine is of eight horse power, and the fuel, of which 1 ton per day is consumed, is anthracite.

The pump shaft is 53 feet long, and the pump is just able to keep the mine free. The ore is of the same general character as that of the mines just considered. It costs about \$2 per ton to mine. The east drift of the shaft ran into Mr. Smyser's land, who gave Mr. M'Cormick a lease for ten years from October 14, 1873 @ \$1 per ton royalty. There is no washing machinery here. The pump is run constantly to keep the water down.

A vertical section of the strata by Thomas Parfit, gave surface of the ground.

Soil and gravel, containing some boulders of trap.....	28'
Sand.....	6'
Ore.....	20'
Foot rock .....	2'

About 2,400 feet north of Logan's present shaft, and in a clump of woods, a trial shaft was sunk by him. No accurate records of this shaft were obtained, further than the information that ore was procured in some quantity. The vicinity of this opening was strewn with large boulders of trap.

The cost of this ore delivered in Harrisburg was said to be in the summer of 1875, about \$3 95.

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\*An analysis of this ore will be found on p. 72 C, of the report of 1874.

*King's Mine. (XXII, 58. No. 127.)*

Is situated 3,300 feet E.  $10^{\circ}$  S. of Underwood's slope, and on the line between Ezra Bell's and Jno. M'Clure's farms.

A shaft was sunk 32 feet by Mr. King in the spring of 1876.

The record of this shaft is as follows:

Soil and loose fragments of trap.....	$6'$
Hard traps.....	$17'$
Ore.....	$9'$

From the bottom of this shaft a horizontal heading was run E. 20 feet, terminating obliquely against a wall of trap to the south, and enclosing a wedge-shaped mass of ore between this wall and the indurated sandstones to the north. From the eastern extremity of this heading a slope was cut upwards to clay in a direction S.  $3^{\circ}$  W. and at an angle of  $22^{\circ} 30'$ .

From this point a drift has been commenced also N.  $5^{\circ}$  E., and at present extending about 50 feet.

At about 20 feet from the foot of the slope two oblique headings have been commenced, running about north-east and south-west. At this point a dip in indurated sandstone gave N.  $40^{\circ}$  W.— $23^{\circ}$ .

At the end of the 50 foot gangway, 12 feet of ore was taken out, but its limits were not ascertained, according to the statement of Mr. King.

NOTE.—Since the early spring of 1876, when Mr. Edwards was detailed to get all the information in regard to this mine and to collect samples of the ore for analysis, further developments have been made by Mr. King, who writes, under date of May 15, 1876, to say that since Mr. Edwards' visit the "quality of the ore has steadily improved as we attained greater depth, the amount of pyrites has decreased and the amounts of lime and magnesia increased, and the vein has assumed a solid appearance. We are 50 feet further on the *dip* of the vein and have driven 40 to 50 feet east on the *strike*.

On the 22d of the same month and year, Mr. King writes: "None of the old mines hereabouts are in operation; consequently, I can give you no information about them. We are now 80 feet through ore (*i. e.*, in the King Mine) on the *dip* of the vein, or rather we have 30 feet of ore in *direction* of *dip*, but having little or no *dip*, and 50 feet of ore with about  $20^{\circ}$  *dip*.

The vein is 9 feet 6 inches thick, arranged as follows, viz: 18 inches of ore on the bottom, then 12 inches of rock, like sand rock, with vertical joints, then 7 feet of ore. The top and bottom rocks seem to be light-colored sand-rock. We drove 50 feet east from the slope, along a fault with slickensides, which crosses the slope at an angle of 70°.

"We had 7 to 8 feet of ore all along in front and at lower side of gangway.

"The fault rock is a mixed up, broken up mixture of sandstone and trap rock, and running immediately behind it on the south-east side is a ridge of that hard dark green syenitic (?) rock found in this region. We found no ore till we got to the north-west side of the fault, and it is considerably disturbed for about 20 feet from the fault. We are about 50 feet from the surface vertically. We are driving our slope N. 5° E., but the dip of the vein is N. 10° W., so that in driving west we will have to swing round to the south considerably in order to keep the vein and allow the water to run off.

"We are mining about 25 tons per day and pump water at the rate of about 30 gallons per minute, doing all the work with three horses—that is, hoisting and pumping."

Three hundred feet west by north of the Underwood slope is an excavation about twenty feet deep, with sides partially washed in. The soil is sandy, and stained red with the oxide of iron. It was opened about twenty five years ago by Abraham Mumper, but no record of the mode of occurrence of the ore was obtained, and it is more than probable that all of it was wash ore from the fragments of the veins in that vicinity. At 200 feet and 300 feet respectively, north of this excavation a couple of pits are found which have the same history as above, but are partially filled with water.

Two hundred feet south-west of the mouth of the slope, and 100 feet west of the engine house are two pits about 10 feet deep, but no ore was visible.

*Old Working.*—Situated a little over 200 feet east of north of the slope's mouth is an old opening of Underwood's, said to have been very deep. The sides show sandy or gravelly soil. The best information at present obtainable in regard to this ore is that

it was a deposit or pocket of wash ore about 7 feet thick. It is said to have been exhausted, and the mine has been abandoned.

*Old Pit.*—Situated about 400 feet east of south of the mouth of Underwood's slope. Mr. Underwood states that the ore was followed from the surface for 25 feet on the slope at this point, though the greater portion of the 2,000 tons which it is said were taken out of here was surface or wash ore. The rocks dipped north. Strength not given. Mr. Underwood reports, also that trap was encountered east of the ore, but Mr. Altland doubts the occurrence of trap at this place.

Mr. Edwards reports large masses of trap in place, of which 10 feet are visible in the south wall of the excavation and coming to the surface. The general dip of the trap he reports as south-west, with sandstone underlying. This information is only partially reliable.

*M'Cormick & Co.'s Old Opening.* (XVII, 9. No. 123 a.)

About 500 feet east of north of the Underwood slope is an excavation covering 12,000 square feet of area, which was opened by John Mumper twenty-five years ago. From a point north of the middle of this pit a shaft was sunk for 140 feet vertical depth. The shaft is now nearly filled with water. The ore is said to have been exhausted. Parts of the machinery are lying about.

One hundred feet north of the bank is a slope constructed for Mr. M'Cormick by the mine boss, Mr. Parfit. The inclination of this slope was 200, and the slope was 60 feet in length.

It did not pay to work the ore all the way down. At the bottom of the slope a vein(?) of 4 feet was wrought. About ten tons of ore altogether were taken out, and the mine was abandoned for a more profitable place. The ore spoken of as having been got out by this slope may have been wash ore.

A superficial opening on the same vein has been made 50 feet east of this slope, but the ore has not been wrought here, and the excavation is only about six feet deep.

*M'Cormick & Co.'s Long Cut and Slope.* (XXII, 9. No. 123.)

This is the most northerly of the group of mines which occurs in this region. The cut, including a small opening in the west

end, is from four to five hundred feet in length along the outcrop line of the ore-vein which it was intended to work. A dolerite which occurs in this mine at the surface, and appears to constitute the top rock of the ore, dips N.  $5^{\circ}$  W. from  $27^{\circ}$  to\*  $34^{\circ}$ . The machinery is still standing, but the mine is practically abandoned and is full of water. Two slopes were driven in to find the ore. The upper one followed the ore vein in between well defined walls at the normal angle of inclination of the sandstone layers. The upper sandstone was continued in the deep, while the foot wall was cut out by a dyke of trap. The lower slope of about  $30^{\circ}$  to  $45^{\circ}$  was continued for 180 feet, and passed through the ore, which appeared to be a very irregular deposit. It is now entirely exhausted.

One hundred and fifty-eight feet north-west of the middle of this cut a bore hole (No. 1 on special map) was sunk, of which the following is a record as given by Mr. King :—

	Feet.
Clay.....	4'
Sandstone.....	0'
Clay .....	2'
Bastard limestone.....	9.5'
Sandstone.....	9.5'
Trap.....	9'
Unknown, about.....	20'
Brown sandstone.....	12'
Iron ore.....	6'
Sandstone.....	4'
Lean iron ore .....	4'

About 50 feet from the cut, and towards the western end, a bore hole (No. 3 on special map) showed—

	Feet.
Clay.....	4'
White sandstone.....	6'
Red sandstone .....	7'
Trap.....	17.5'
Black and green sandstone .....	4'
Brown sandstone.....	1'
Green sandstone.....	8'
White sandstone .....	1.5'

---

\* Mr. Altland makes it "north  $50^{\circ}$  to  $10^{\circ}$  west, from the horizontal about  $20^{\circ}$ ."

Bore hole, No. 4, situated about 150 feet east of south of the eastern extremity of the long cut, gave:

	Feet.
Surface.	
Clay.....	2'
Gray sandstone.....	8'
Red sandstone.....	7'
Unknown.....	10'
White sandstone.....	7. 5'
Greenish-white sandstone.....	6.16'
White sandstone.....	6.41'
Green sandstone.....	2.83'
Red sandstone.....	0.50'
Black (?) trap.....	16.08'
White (?) trap.....	6.66'
Ore.....	1.50'
White sandstone.....	22.25'
Green sandstone.....	13.16'
Red and white sandstone.....	6.00'

Bore hole, No. 5, sunk in "M'Cormick's & Co.'s old bank," showed:—

Surface.	
Soil .....	8.84'
Green sandstone.....	0.17'
Iron ore.....	0.17'
Gray sandstone.....	4.50'
White sandstone.....	6.17'
Reddish green sandstone .....	12.08'
Black (?) trap.....	23.07'
Gray sandstone .....	3.25'
Iron ore.....	3.25'
White sandstone.....	5.00'
Iron ore.....	1.33'
White sandstone.....	11.00'
Limestone and flint.....	6.00'
Limestone and fire-clay.....	10.00'
Red sandstone.....	14.00'
Green sandstone.....	4.00'
White sandstone.....	9.00'
Green sandstone.....	3.00'
Iron ore.....	2.00'
Sandstone.....	2.00'
Sandstone and ore .....	3.00'
Limestone and flint.....	6.50'
Ore and sandstone.....	0.50'
Green sandstone.....	5.00'
White sandstone.....	5.00'
Green sandstone.....	6.00'
White sandstone.....	1.00'
Gray trap.....	2.00'

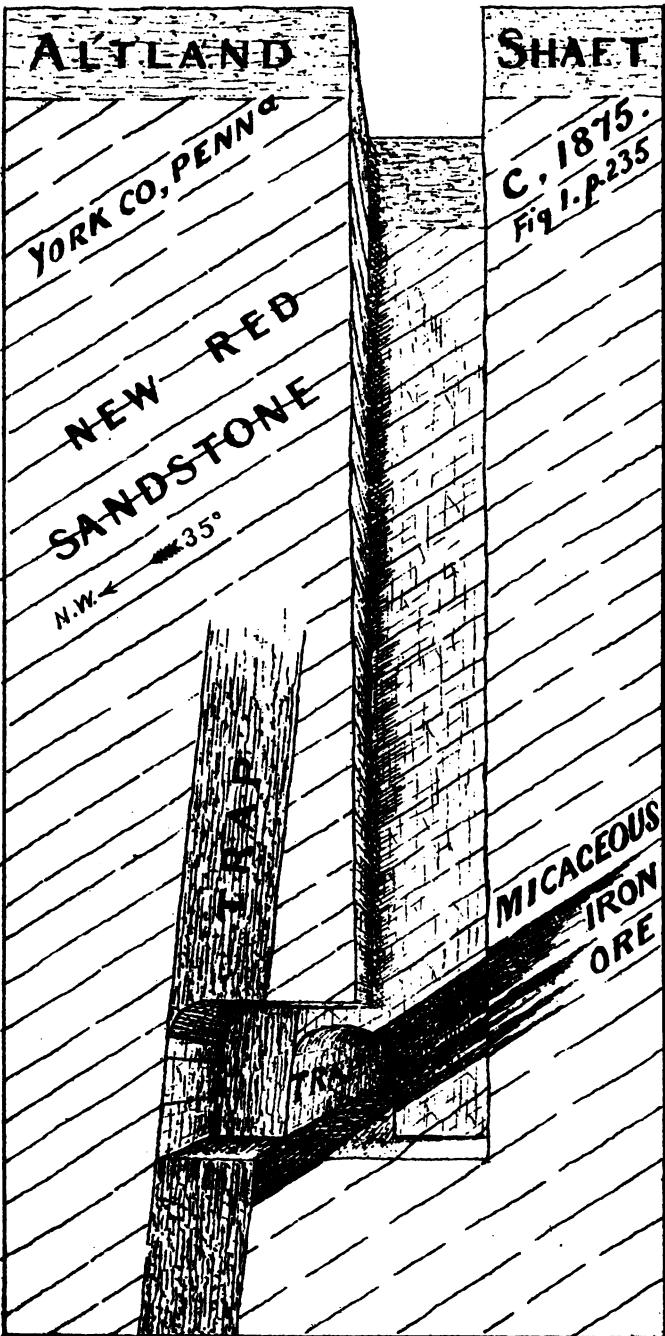


Photo-Litho & Printed by J.H. Camp, 519, Gayne St. Philad'l'a



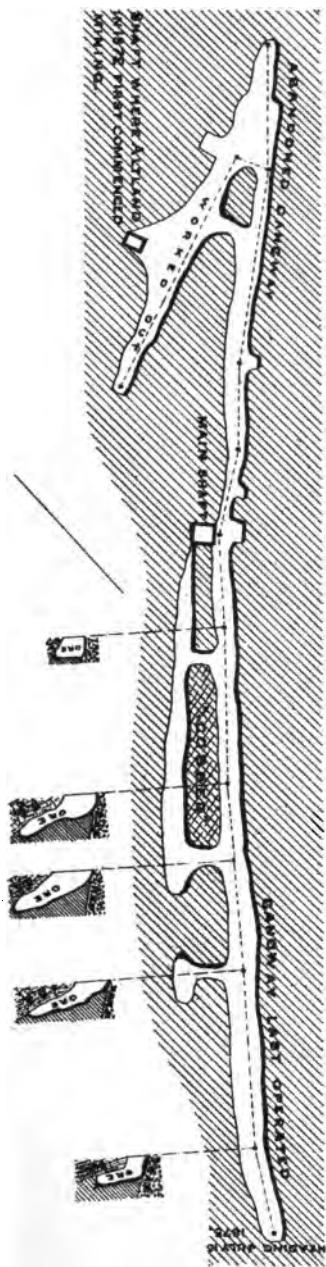
C. 1875.

SEE PAGE 236.

Fig. 2

Second Geological Survey of Pennsylvania.

GROUND PLAN OF ALTLAND OR MINE BANK.  
YORK COUNTY.



SCALE OF FEET.

Q.S.M. D.L.



White sandstone.....	2.00'
Limestone.....	3.00'
Gray sandstone .....	4.50'
Red sandstone.....	4.00'
White sandstone.....	4.00
Red sandstone.....	1.00'
White sandstone.....	4.00'
Red sandstone .....	3.00'
White sandstone.....	4.50'

About 1,000 feet south-east of the point from which the distances have heretofore been given ; *i. e.*, Underwood's slope, is

*Smyser's Open Cut. (XVII, 11.)*

This Bank was opened in 1852 by James Myers and Henry Musselman, of Marietta, to whom it was leased for ten years. They wrought it for about eighteen months and threw up the lease.

Abraham Mumper purchased the property and worked it for six or eight months. Mr. Smyser subsequently bought the farm back and worked the mine, taking out about 1,000 tons of ore. Altogether the amount of ore taken out was nearly 3,000 tons. It was of the same character as that at Underwood's and M'Cormick's. Most of the ore was used at Marietta by Musselman ; the rest at Whitestown.

The sides of the bank slope about  $40^{\circ}$  and the bank is about 30 feet deep and is partially shut.

The upper part is composed of gravel and loose soil. No rock in place is at present visible.

Mr. Smyser (from whom the above data was obtained) states that the lessees sank about 45 feet before ore was struck. This ore had a thickness of 25 feet and "dipped gently *south-east*" (?)

The foreman of the working states that the ore dipped south-west where worked, and rested on a saddle of trap. He adds that a south-east dip would doubtless be obtained further to the south. Neither of these statements form a satisfactory basis of any theory owing to their unreliability.

When the bank was operated the ore was hauled out by horse and cart. It did not require to be washed. It was scattered through the bank, but was hard to get at and does not pay to mine.

The trap which occurs in this bank was very confusing, and Mr. King reports being unable to ascertain its direction of dip after examining it.

Mr. Altland mentions the same difficulty having occurred to himself on the occasion of a visit last autumn (1875.)

*Ezra Bell's Ore Mines. (XVII, 11. No. 128.)*

This property was leased to Mr. M'Williams since April. The shaft is 33 feet deep and a drift has been commenced. In June last 100 tons, more or less, had been taken out but none had been sold.

The terms of the lease are 50 cents royalty per ton for ten years. The works were just commenced at the time of this visit, in June, and only four hands were employed. The dip of hanging and foot walls seemed to be about N.  $10^{\circ}$  E.  $20^{\circ}$ . Specimens of the different strata were selected. Hard limestone boulders were noticed from the surface to the ore, a distance of 25 feet.

A slope has been sunk about 100 feet south-west of Bell's shaft 180 feet long. At 100 feet on the slope (assuming the slope to be N.  $10^{\circ}$  E.— $20^{\circ}$ , the projection of this point upon the surface would be 94 feet from the slope-mouth, and the point itself 41 feet below the surface).

The drift has been cut (probably W.  $10^{\circ}$  N.) from the foot of the slope for 75 feet. 125 down the slope (or 51 feet vertically, under a point on the surface 117.5 feet N.  $10^{\circ}$  E. from the slope mouth,) a second drift has been driven E.  $10^{\circ}$  S. 50 feet.

Ore has been obtained from this mine, but the precise localities are not indicated.

If the surface were level between Bore Hole No. 3 and Bell's Shaft, and the traps continuous, the latter should have been found at 30 feet below the surface. Allowing for the difference of level between the two points (between 5 and 10 feet) the traps should have been struck at about 20 feet below the mouth of the shaft.

The excavated material and ore from this shaft is raised by windlass. The shaft is cribbed from the top down and drifts

are driven from the bottom south and north. In September this mine was said to have been leased by M'Cormick & Co.

*Joseph L. Grove's Bank.* (XVII, 12. No. 129.)

Is situated about three-fourths of a mile south-east of the Underwood slope, was opened about two years. Eagle & Schultz, of Newport, Perry county, are lessees.

Over 350 tons had been taken out altogether when business difficulties caused the firm to cease operations.

The slope is about 25 feet long, and at an angle of 25°. The horizontal distance of the drift at bottom (west) is about 50 feet. The royalty paid Mr. Grove was \$1 00 per ton. The ore, which is of the same character as that of the Underwood and Logan banks, was taken to Newport and wrought in the Marshall furnace. There is no lease upon the property at present.

The ore was hauled to Dillsburg Station ( $1\frac{1}{2}$  miles) by private teams, for 50 cents per ton. 3 to  $3\frac{1}{2}$  tons constituted a single load and were hauled by a four-horse team when the roads were in good condition. The mouth of the mine has caved in and it is full of water. The rocks (much resembling weathered traps) dip N.  $10^{\circ}$  E.— $24^{\circ}$ .

The greater part of the old machinery has been taken away. Specimens of the ore and trap were secured and the above information was obtained from Mr. Grove.

*Abraham Price's Mine* (XVII, 72. No. 130.)

This bank is a large open cut, situated 4,800 feet south  $41^{\circ}$ , 30' east of the Underwood slope.

It was opened about twenty years ago by Henry Seidel, of Dillsburg, and was afterwards wrought by Rufus Castell. For the past eleven years it has been the property of Mr. Price. The bank is at present 350 feet east and west by about 125 in its broadest part north and south, and 15 to 20 feet deep. The west end is filled with water. A large amount of magnetic ore has been taken out of it. It has been unwrought for fourteen years, and is now partially overgrown with vegetation. A six foot vein is said to be fourteen feet beneath the surface of the ground. An exposure of sandstone occurs on its north side, but no dip was obtainable. Large quantities of ore are re-

ported to underlie various parts of the farm, but no exhibit was discovered.

NOTE.—For further analyses of these ores see report of progress for 1874, pp. C. 73 and 74.

Near Price's bank the dip needle gave  $10^{\circ}$  to  $30^{\circ}$ , and close to Price's house and barn, near Stony Run,  $40^{\circ}$ .

Mr. Altland observed a strong attraction in the dip needle along the woods near him.

An outcrop of ore is observed to cross the road.

A dip of sandstone was obtained here south-east— $45^{\circ}$  (?)

*The Landis Ore Bank*, better known as the

*Fuller Mine (XVII, 49. No. 131.)*

is situated 3.48 miles north-east of Dillsburg. The property belongs to Mr. Landis, and was leased by Mr. Jos. Fuller, of Philadelphia. The property originally belonged to P. Kneisley, and was opened by him twelve years ago, after which H. H. Sheeley took a lease, and wrought the bank for three months. Mr. Fuller leased from Mr. Landis for twenty years from June 1, 1875. The lease is at a royalty of 80 cents per ton, with a proviso to pay that amount on at least 500 tons annually. Up to June 19, 1,400 tons had been taken out, or an average of 15 tons per day.

The cost of mining is 75 cents per ton, including all mining expenses. The ore is shipped per Harrisburg and Potomac railroad to Wister's furnace, at Hamburg, and to Daniel Ahl's furnace at Boiling Springs.

A tunnel from the railroad, and close to the bank of the Yellow Breeches creek, enters a steep bank due south for 200 feet. Two drifts lead off west and one east of the main tunnel. The hanging wall is trap dipping N.  $45^{\circ}$  W.  $24^{\circ}$ .

The ore is strongly magnetic.\* Foot wall greenish colored p. 74 C.

altered sand-rock. No machinery is necessary. The ore is pushed by hand cars from the headings and loaded on the ore cars of the Harrisburg and Potomac Railroad.

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\* For analysis of ore of the Fuller mine see Report of Progress for 1874,

The tunnel is at present above water level, and no trouble from water is experienced. Six men are employed, all in the mine.

The wages are \$1 10 per day of 12 hours. They were at first \$1 75.

Mr. Fuller is sinking a slope to the main tunnel preparatory to putting in machinery to raise the ore and pump out the water which will accumulate as soon as either of the slopes reaches a point below the level of the creek.

An analysis of the ore gave 62 per cent of both oxides of iron, (see p. 74 C.) phosphoric oxide, 0.05, and sesqui-oxide of manganese, 0.352. In the furnace the ore is said to yield in large quantities about 52 per cent of the mixed oxides.

*Ex-Governor Porter's Bank. (XVII, 50. No. 182.)*

This open bank was commenced over 20 years ago by Governor Porter, and was wrought 5 years by him. Abraham Price then bought the property and worked the mine about eight years. No machinery was ever used except a pump driven by water power, obtained from the Yellow Breeches creek close by. The ore was taken out in carts and sent to Harrisburg, and was pronounced very good by the consumers, whose names, however, were not obtained. The ore was magnetic. The excavation is about 40 feet deep and 14 feet below the surface of the water in the Yellow Breeches creek. From eight to ten men were employed in the mine. The wages were from \$1 25 to \$1 50 per day. The ore was said to dip about  $30^{\circ}$  towards the creek and to underlie the latter. The mine is at present very much overgrown with vegetation, and there is no lease on it. The property belongs to the heirs of Abraham Price. No rock is exposed in the banks at present, but a limestone in a railroad cut close by (Auroral limestone ?) dips S.  $10^{\circ}$  E.— $30^{\circ}$ . The ore bed in this mine is said to have been 3 to 6 feet thick and was opened for 25 feet along the strike.

No specimens were obtained from the bank, and it is difficult to determine if by the reported "magnetic" ore is meant ore resembling the Dillsburg type or the "magnetic" ore of the York Valley. The probability is that the ore belongs to the older rocks, the Yellow Breeches approximately dividing the two formations.

*Shelley's Ore Mine. (XVII, 50. No. 133.)*

This mine was opened about 3 years ago by P. J. Miller, lessee, for ten years. It was worked for about two months, and 300 tons of ore were taken out and sent *via* Mechanicsburg, to M'Cormick & Co., of Harrisburg.

The ore is said to have been magnetic. The working has now partially caved in. The bed is said by Shelley to be ten feet thick. From the informant it was learned that under the soil 20 feet of trap was penetrated, under which was ten feet of ore and the bottom was left in "*Potomac Marble*."

The ore was partly obtained with a pick and partly by blasting. Six men were employed. A shaft was also sunk through 30 feet of trap and ore was found. (The position of this shaft was not ascertained.) Since that time the mine has been idle.

If the observation of Potomac Marble and trap be correct, a slight alteration in the boundary line of the old geological map between New Red and Auroral, will have to be made, bringing the former up to the banks of the Yellow Breeches east of the Harrisburg road.

*Jacob Heikes's Shaft. (XVII, 55. No. 134.)*

Ten years ago a shaft was sunk by Jacob Heikes about half a mile south-west of Dillsburg. Mr. Porter states that 3 or 4 tons were taken out of it, when, the pocket being exhausted, it was abandoned.

A quarter of a mile nearer to Dillsburg, on the farm of Mr. Porter, a few trial pits were said to have been opened, but without finding any ore.

Here there occurs a very feldspathic igneous rock to all appearances rich in hornblende. It will be more fully described, along with the other traps, in another part of the report.

*Filler's Ore Pit. (XVII, 69. No. 135.)*

Situated a little more than a mile south by west of Dillsburg. It is now 8 feet deep and 4×6 feet in area. It has been sunk through sandy soil and gravel, and partly through soft, much disintegrated trap.

Mr. Filler reports that when he discontinued work at the bottom of his excavation the rocks seemed to dip westwardly and the ore to conform to them.

The indications of a large body of ore are reported to be not encouraging.

*Peter Berghart's Ore Pit.* (XVII, 80. No. 136.)

Situated about 1.7 miles a little west of due south of Dillsburg.

It was begun 18 months ago, and is now 18 feet deep. The first 13 feet were sunk through soil and small fragments of red sandstone.

Below this was 1 foot of red sandstone, which had to be blasted.

Below this were six inches of ore. (No specimen fairly representing the average of the ore was found.)

Below the ore more red sandstone was encountered and the work was suspended before this rock was penetrated.

Nothing left on the ground implies the existence of any quantity of ore worthy of consideration, and nothing to show the character of the deposit.

*Henry Heiges's Ore Pit.* (XVII, 70, No. 137.)

Situated a little more than two-thirds of a mile S. W. of the last mentioned ore pit. It was commenced about three years ago. The holes appear now to be about 4 feet deep. Ore is said to have been found, but no specimens were at hand.

The debris of the land in the vicinity, and especially the heaps about the mouth of the shaft, seemed to be composed of soft disintegrated masses of syenitic dolerite.

No solid rock was visible.

*Abraham Heiges's Ore Pits.* (XVII, 78, No. 138.)

Situated about one-third of a mile S. W. of Henry Heiges.

The excavations are about 4 feet in diameter, and 2 to 6 feet deep. They have been dug from time to time during the last ten years. Very little has been taken out but syenitic dolerite, very much decomposed. No ore was to be found. Indications are rather unfavorable to the belief in a large supply.

One of the pits on the farm (now filled up) is said to have produced ore and "syenite" together.

Specimens were taken.

The above information was obtained through the courtesy of Mr. A. Heiges.

*George Heiges's Ore Workings. (XVII, 73. No. 139.)*

The occurrence of ore in this locality was discovered 12 years ago by Mr. George Heiges, and leased to him and Mr. Baish, of Franklin township, for 5 years. Very little was done towards opening the works, and when the lease expired, the farm was leased again to Mr. John Underwood for 10 years. Mr. Underwood only sank a few small pits. After the cancellation of this lease, Mr. Abraham Weigel, of Adams county, took the lease. Finally, Mr. Hildebrand, of Whites-town furnace, secured it. Not much has been done by any of the lessees towards developing the property to its full capacity.

A shaft (No. 1 of the map) has been sunk 30 feet through trap rock, in which, however, no dip could be obtained. A slope was sunk at 2 on the map, and a tunnel driven to connect them together. The slope has now fallen in and resembles a pit.

The material exposed in the banks of this cut is a greenish sandstone. The slope begins at the N. W. end of the open cut and extends for 15 feet. The bed of ore is said to be 4 to 5 feet thick, and is exposed for a width of 20 feet. No machinery was ever used here, the ore being taken out in a wheel barrow. No lease exists at present on the property. The farm covers about 176 acres.

The dip needle is deflected  $10^{\circ}$  to  $20^{\circ}$  all along this ridge.

Dip, N. W.— $20^{\circ}$ .

There are indications in this vicinity that the lower pre-Silurian slates crop out here, though they are cut off between here and the South Mountain by a mass of red shale which crops out suddenly about one-fourth of a mile S. W. near Lerew's. Close by Mr. Hare's house, on the Petersburg road, the slates resemble those just mentioned. A shaft is opened in a field to the east. On Mr. Porter's farm, one-half mile south of Dillsburg, a very feldspathic dolerite is encountered. The S. end of the dip needle is deflected  $15^{\circ}$ . The soil shows a sudden change in passing from the older slates on to the New Red.

*John Lemer's Ore Pit. (XVII, 82. No. 140.)*

Situated a little over a mile S. E. of Dillsburg.

The pit is sunk through the red sandstone, and is four feet deep. The ore was six inches thick about 2 feet from the surface of the ground, and was exposed along its outcrop for 3 or 4 feet only.

The bed seemed to dip slightly to the E. of N. Only a poor specimen was obtainable.

The rocks were loose, fragmentary, and very much broken up.

*John Kuntz's Limestone Quarry. (XVII, 20. No. 141.)*

Situated about 1 mile N. W. of Dillsburg. The quarry is in a coarse conglomerate resembling the Potomac Marble. The lime is said to be equal as a fertilizer to that of the Cumberland Valley. It sells in the neighborhood for nine cents per bushel at the kiln. Mr. Kuntz pays \$20 00 per thousand bushels for the right of quarrying this rock. The admixture of sandstone does not appear to interfere with the utility of the conglomerate as a top dressing.

Two dips taken at the east end of the quarry gave, respectively, S.  $45^{\circ}$  W.— $24^{\circ}$ , and S.  $10^{\circ}$  E.— $40^{\circ}$ .

This belt of conglomerate limestone resembles that of the Auroral limestone in being honeycombed into caverns below water level. A stream flows into a hollow at this quarry and disappears after the manner of similar streams at various points of the great valley.

*John Kuntz's Paint Mine. (XVII, 21. No. 142.)*

Situated about 400 feet N. W. of the limestone quarry.

These works were opened two years ago by Mr. H. Hurst, of Mechanicsburg, who leased the property from Mr. Kuntz for fifteen years from October, 1874, at \$1 per ton royalty.

The material which he mines is a red and a yellow clay ochre. This is ground and prepared for shipment at a mill not far off, and is then sold to all parts of the country.

Five hundred tons are taken out per year, but the mines as yet are not in full operation. Mr. Hurst's estimate includes

the taking out of 3,000 tons per year, but the mine is not yet worked up to its full capacity.

The shafts are all small—from 5 to 15 feet deep, and 4 to 10 feet in diameter. The material is excessively soft, being the wasted and kaolinized Huronian schists which form the flanks of the South Mountain, and of course no blasting is required.

*Christian Bender's Magnetic Ore Mine. (XVII, 64. No. 125 a.)*

Situated in the Mesozoic Sandstone, and close to its border, about  $1\frac{1}{2}$  miles S. W. of Dillsburg.

The working is all by open cut.

It was opened by Charles Bender in 1849, who used 200 tons of ore at the Whitestown furnace. It was idle from 1849 to 1873, when Taylor & Co., and Ruth & Co. took possession of it. Eighty tons were taken out at this time and used in Millersburg, Perry county. Under seven feet of stripping, a pocket of ore averaging 5 feet in thickness was found. Altogether, 300 tons were taken out, according to Mr. Bender. This pocket was worked out; but he states that within a radius of 100 feet around the place originally wrought, trial shafts have developed other deposits of about equal thickness.

The ore is reported by him to be magnetic, and of average quality.

It was hauled by wagon at \$1 50 per ton 11 miles to Whites-  
town.

The pit is now caved in and partially overgrown with bushes. A shaft was sunk from the bottom of the pit, and the total depth of the bottom of this shaft below the surface was 32 feet.\*

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\*Mr. Levi Gross, of Dillsburg, states that two cart loads of magnetic ore from Bender's mine were dumped by him in a hole near the shanty, which still stands near the edge of the bank next to be described.

Mr. Gross describes this ore as having occurred in a hard rock *behind the variegated clays, and dipping with them from the Mountain.* This occurrence would be of singular interest if confirmed, for it would establish the existence of large quantities of magnetite in the South Mountain rocks, and renders the problem of the genesis of the Mesozoic magnetite more easy. But however glad we might be to accept this fact, such careful examination of this bank as its condition rendered possible, failed to exhibit more than small quantities of magnetic ore scattered about; so that, for the present, I am reluctantly obliged to suppose that there was some misunderstanding as to which of Mr. Bender's banks furnished this ore, and that this bank was the one meant.

The following is an analysis by Mr. David M'Creadh of some ore from this bank, which, although poor as a specimen, was the best that could be had.

	Per cent.		Per cent.
Iron sesquioxide.....	45.428	Metallic iron.....	31.800
Alumina .....	8.676		
Manganese sesquioxide..	0.298	Metallic manganese....	0.208
Lime.....	0.290		
Magnesia.....	0.987		
Sulphuric oxide.....	0.128	Sulphur.....	0.051
Phosphoric oxide.....	0.476	Phosphorus.....	0.208
Water.....	10.230		
Insoluble residue .....	33.330		
	<hr/>		
	99.843		
Undetermined and loss..	0.157		
	<hr/>		
Total.....	100.000		

*Christian Bender's Limonite Bank. (XVII, 66. No. 125.)*

Situated about three-fourths of a mile N. of W. of the last in the decomposed schists which as clay form the flanks of the South Mountains.

The bank is an open cut covering an area of about half an acre.

It was opened by Mr. Bender in 1874, and leased to Samuel Bahn and C. S. Stone for 12 years, on condition that a royalty should be paid on 1,000 tons a year @ 60 cents per ton. They worked the bank for 18 months, and took out 2,000 tons of ore which was used in Messrs. M'Cormick's & Musselman's furnaces. The engine at the bank is of twenty horse power, and the pump shaft 18 feet long. A double cutter washer is used. The ore, which is mainly wash ore, is hauled out of the banks by horse and cart at the rate of about four tons per day. From 6 to 8 men are employed in working this mine @ \$1 25 per day of ten hours.

Twelve to 20 feet of stripping was removed before the imbedded limonite fragments and streaks of testaceous ore were found rich enough to pay. Twenty-three feet of this has been passed through with no sign of diminishing in quantity.

The general direction of dip of the ore is towards the south.

But little lump ore of large size is found. After the bank had been wrought about a year Mr. Bahn died, and Mr. Hilde-

brand became a partner. The bank was wrought altogether about 18 months, and has been since idle. No machinery remains but the washer. The sides have partially caved in. There is no deficiency of water for washing the ore when the bank is in operation, as it is brought from a spring not far off. The sides are partially overgrown with vegetation.

A dip obtained from one of the layers of variegated clay was about S.— $56^{\circ}$ .

*M'Cormick's Bank.* (XVII, 65. No. 126.)

Situated S. W. of the Bender bank; the N. E. edge of it about 100 feet S. of the S. W. end of the latter.

It is said to have been known as a repository of ore upwards of 100 years ago, and it has been worked by different parties for many years. The wash ore used to be separated by rakes before the improved washer was introduced. Mr. M'Cormick & Co. purchased the property from Mr. Atticks about fifteen years ago. Two barrel washers were in operation till recently. The water was obtained from the same spring which fed Bender's washer. Very little ore is showing in the bank. It was hauled out by horse and cart. Very few large masses of ore have been met with in the bank. The direction of dip of the planes richest in ore seems to be the same as in Bender's bank, but the inclination to be less steep. The excavation is about 35 feet deep, and the bottom filled with water.

No rock is exhibited, and no termination of the ore-yield has been found at the lowest level yet attained. The machinery is entirely removed. The pit covers an area of about two acres.

(XVI, 61.)—Both of these last mentioned banks are partly segregations, partly alterations in place, of iron minerals in the old decomposed crystalline schists. By paring down the edges of a bank of this kind the streaks of variegated clay corresponding to the edges of the former laminæ are seen in their normal positions. A plate of homogeneous matter can thus be followed, and from its observed dip, that of the schists from which it has been formed, established. These variegated clays interstratified with testaceous and plate-like limonite gave in the last two banks a dip of about S.  $30^{\circ}$  E.— $30^{\circ}$ .

Many of the leaves of clay are incrusted with light deposits of the hydrous oxides, while, at intervals, irregular masses of ore are found.

Many of the leaves are twisted and bent, and plates of hard and brittle ore are seen following their courses, showing plainly that this ore has become what it is, long after the folding took place.

*Jacob Lichte's (or Lighty's.) (XVII, 99. No. 121.)*

Situated about  $5\frac{3}{4}$  miles S.  $33^{\circ}$  W. of Wellsville.

It was opened in October, 1872, by Mr. Henry Kraber and Levi Gochenour, for three years, at a royalty of 75 cents per ton. They extracted about 1,000 tons, and agreed to take out as much as possible, suspending work in the winter. The ore was taken out by horse power in a very rude manner by an incline. The ore was not washed. The water in the mine was pumped out by hand.

The mine is a narrow cut, in which at two points slopes were begun, but terminated in thirty-five feet from the initial points. The ore which was said to occur in a vein of about 6 feet in thickness, was hard lump and rock ore, and was pronounced red short by Mr. Lighty.

The open work is about fifteen feet deep. A large dyke of dolerite occurs in the roof of the mine and apparently follows the ore in the deep, and dipping about N.— $45^{\circ}$ .

The gangue of the ore is an altered sandstone, in fine layers, dipping N.  $20^{\circ}$  W.— $50^{\circ}$ . It was magnetic, but no characteristic specimens were obtained. The north end of the dip needle was depressed  $50^{\circ}$  in the cut—*i. e. North*  $50^{\circ}$ .

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The following shafts in the region of the Mesozoic sandstone north of the line from Dillsburg to Wellsville are mentioned on account of the fact that some traces of micaceous ore have been found in some of them. In addition, it is of advantage to catalogue all the exploitation works of the district, even though they have not succeeded in proving the presence of ore.

Mr. Altland reported a deflection of the miner's compass of  $10^{\circ}$ . Observations in the same locality by my party gave from  $1^{\circ}$  to  $5^{\circ}$ . No work has been done here.

Mr. Cannon's farm lies  $4\frac{1}{2}$  miles due east of Dillsburg.

*P. A. Meyers' Pit.* (*XIX, 5. No. 143.*)

Situated about 600 feet south of the corner of Cannon's field. The shaft was sunk 16 feet deep through red sandstone, when hard bluish trap was encountered. Some of the red sandstone from the shaft was coated with micaceous ore. The shaft is partly caved in.

Where Mr. Underwood reported a dip of  $170^{\circ}$  with the dip needle, one of only  $2^{\circ}$  was observed by us.

*Elicker's Trial Shafts.* (*XIX, 6. No. 144.*)

Situated about 800 feet N. E. of Meyers'.

A small shaft 15 feet deep has been sunk, since May, 1875, through loose masses of hard trap.

The dip of the rocks in the bottom of the shaft is W.  $40^{\circ}$  N.— $24^{\circ}$ .

Some asbestosiform hornblende was found in the shaft, and also some micaceous ore. The shaft is being increased in depth. Two men were at work on it at the time it was visited, (July 7, 1875). Some few specimens of rock were coated with micaceous ore, but the place was probably exploited on account of the indications of the dip needle, and the effect on the latter was in all probability produced by the trap itself, which is frequently strongly magnetic.

The rocks are very much broken in the shaft, and much loose sand is found there.

Mr. Altland reports that one mile E. of this, on the Kline farm, (now owned by Mr. Strayer,) shafts have been sunk, and the "prospects are good."

*John Kimmel's Farm.* (*XIX, 8. No. 145,*)

Situated about two-thirds of a mile north-east of Elicker's. Small amount of micaceous ore have been found coating the sandstones of the vicinity, but none in large quantity. Most of the specimens thus found were ploughed up from the soil, in which they were simply loose fragments.

*Cooper's Exploitation Shafts. (XIX, 19. No. 146.)*

Situated about  $1\frac{1}{2}$  miles a little east of north of Wellsville.

No. 1 is a shaft sunk by Messrs. Cooper and Monosmith two years ago to a depth of 27 feet. No ore was obtained and the shaft has now caved in. The first four feet were sunk through soil and loose sand of a deep red color. Gray sandstone appears in the bottom of the pit.

No. 2 gave very nearly the same record as No. 1. The rock specimens strongly deflect the needle. This shaft was 20 feet deep, but has now fallen in. From the fragments of rock around its mouth the excavation must have been to a great extent through the same gray sandstone met with in No. 1.

*Morganthaler's Ore Shaft. (XIX, 19. No. 147.)*

Situated a couple of hundred feet south-west of Cooper's shaft, No. 2, last mentioned. This place was opened 4 years ago by Jacob Morganthaler, and leased by Messrs. Cooper and Monosmith. The lease has since expired. The shafts were originally 20 to 30 feet deep, but are now almost completely caved in. The ore obtained from all the openings is strongly magnetic.

The shafts marked 2 and 3 on the maps were connected by a tunnel ten feet below the surface. From 6 feet below the surface the ore occurred in large lumps.

About 800 feet north by west of these two shafts occurs a field underlaid by an extensive deposit of plastic clay, of which the constitution will probably accord with that of Mr. Griest's clay analysed by Mr. Ford, and to be found on the next page.

A dip in the sandstone appeared to be N.  $20^{\circ}$  E.— $58^{\circ}$  (?)

*Michael Wiley's Outcrop. (XIX, 20. No. 148.)*

Situated about 600 feet south-west of the last mentioned.

Iron ore can be picked up over a large area around this point. An outcrop of ore is reported by Mr. Lehman in front of Mr. Wiley's house.

A large specimen of magnetic ore was taken from a point 1,000 feet east of the house.

A purplish colored trap is reported on the same authority as being found very extensively distributed over the property.

*Jacob Brenneman's Clay Deposit. (XIX, 22. No. 149.)*

Situated about one-fourth of a mile N. W. of the town of Wellsville. No exploitation has been made here, and the specimens selected were mere fragments of outcrop strewn over the ground. The clay was said by Mr. Brenneman to be found over the greater portion of the farm. This region is low, and in many cases swampy, the clay deposit being found between the lines of low hills, which are due to the traps and the indurated rocks associated with and accompanying them.

*James Griest's Clay Beds. (XIX, 23. No. 150.)*

About one-fourth of a mile N. W. of Mr. Brenneman's Clay deposit is a similar deposit of James Griest.

No opening of any extent has been made. A quantity of this clay was collected and forwarded to Harrisburg for examination. It yielded to Mr. Ford's analysis,

	Per Cent.
Silica.....	57.590
Alumina.....	19.297
Ferrous oxide .....	6.429
Lime.....	1.285
Magnesia.....	1.502
Alkalies.....	1.970
Sulphuric acid.....	0.016
Water and organic matter.....	12.049
Sum.....	100.138

On comparing the above analysis with any analysis of good clays, it will be seen to be too low in alumina and too high in ferrous oxide for a good fire clay, and it is only moderately good for common bricks.

*J. Harman's Exploitation Pits. (XIX. 24-25. No. 151.)*

Situated a little more than half a mile N. W. of Griest's.

Here occurs an exposed ridge of a very coarsely crystalline syenitic granite. This rock is strongly magnetic from large numbers of fine crystals of magnetite which are scattered through it, but it nowhere assumes the character of an ore. The rock is anomalous, and will be treated at length in a future page under the head of "the igneous rocks."

The deflection of the dip needle at the S. E. side of the pit was 46°. On the other side it varied from 5° to 25°. In the

pit the deflection was only 5°. The pit was dug by Daniel Altland two years ago, and was at one time 14 feet deep, but has now caved in.

Ore is reported as having been taken out here, and from the adjoining farm bought by Mr. Altland from Mr. Burd, but no indications of ore were observed.

*John Gerber's Exploitation Pit.* (*XIX, 26. No. 152.*)

Situated about 1,000 feet N. E. of James Griest's. A shallow pit of 4 feet or more has been dug by the roadside. Fragments of a light yellowish rock were found, much disintegrated, and covered with ferrous hydrate.

*Daniel G. Altland's Exploitation Pits.* (*XIX, 27. No. 153.*)

Situated on his land about one mile W. of Wellsville. Some very shallow pits were made about a year ago, and some rock impregnated with ferrous hydrate was taken out.

*Henry Comfort's Ore Pits,* (*XIX, 28. No. 154.*)

Situated about one-third of a mile south-west of the last mentioned pits. Some small openings were made here by Daniel Altland for Mr. Kraber, of York, two years ago. Light colored sandstones, with a few patches of lean ore were found. John Underwood also worked to a small extent, and has now a lease on the farm, but has done no work. An outcrop of dolerite is inferred from a large number of boulders of this rock strung along the road.

The ore is feebly magnetic.

An analysis of specimens of Comfort's ore was made by Mr. D. M'Creadh, and is as follows:

	Per cent.		Per cent.
Ferrous oxide.....	8.485	Metallic iron.....	33.450
Iron sesquioxide.....	38.357		
Alumina.....	3.005		
Manganous oxide.....	trace.	Metallic manganese... ..	trace.
Lime.....	2.620		
Magnesia.....	0.627		
Sulphuric oxide.....	0.112	Sulphur.....	0.045
Phosphoric oxide.....	0.240	Phosphorus.....	0.105
Water.....	2.515		
Insoluble residue.....	43.490		
 Sum.....	 99.451		
Loss.....	0.649		
 Total.....	 100.000		

*David Cadwalader's Ore Pits. (XIX, 29. No. 154 a.)*

Situated on the opposite (north) side of the road from Comfort's. The diggings were made by Mr. Altland, four years ago, who then had a lease on the property. The conditions of the occurrence here are similar to those at Comfort's, across the road.

The pits were originally fourteen feet deep, but are now caved in.

*Joseph Bentz's Farm.*

An analysis of a magnetic ore taken from the farm of Jos. Bentz, about two miles south-west of Wellsville, was made by Mr. D. M'Creath, is given below:

	Per cent.	Per cent.	
Ferrous oxide.....	11.700	Metallic iron.....	63.700
Iron sesquioxide.....	78.000		
Alumina.....	5.420		
Manganous oxide.....	0.667	Metallic manganese...	0.367
Lime.....	0.280		
Magnesia.....	0.169		
Sulphuric oxide.....	0.077	Sulphur.....	0.031
Phosphoric oxide.....	0.100	Phosphorus.....	0.044
Water.....	0.250		
Insoluble residue.....	3.120		
Sum.....	<hr/> 99.783		
Loss.....	<hr/> 0.217		
Total.....	<hr/> 100.000		

Mr. Bentz is of the belief that his whole farm is underlaid by this ore.

*J. Marshall's Exploitation Pits. (XIX, 30. No. 155.)*

At the road corners near J. Marshall's house is an outcrop of micaceous ore in the boulders of trap.

The color of the soil changes from a light drab to a yellowish red. No ore was shown, but the place is but little off the line of strike of ore in the Altland bank.

*John Shluthower's Shaft. (XIX, 30. No. 156.)*

Situated about  $1\frac{3}{4}$  miles south-west of Wellsville. It was commenced last fall and is 42 feet deep. No ore was observable. The shaft was sunk through a bluish-green hard rock. Some of the fragments taken out have a bright green color from malachite. The material was the same to the bottom of the shaft, except a few feet of loose sandstone at the top.

*The Mine School-house or Altland Ore Bank. (XIX, 35. No. 121.)*

Ore was first discovered in the vicinity of the present workings about 70 years ago. It was picked up on the surface of the ground in lumps of irregular and various size. The property was then, as now, in the hands of the school trustees, having been donated to the county many years before.

Mr. Dan'l G. Altland, Jr. first remarked the presence of ore in August, 1872. He found and dug up numerous large masses of mixed micaceous and magnetic ore at stations 3,226—27, and at 3 (*See plan of south-west gangway*).

A shaft has passed through 5 feet of soil and 25 feet of sandstone, and struck a 6 foot bed of micaceous ore, the foot wall of which was the same sandstone as the hanging rock, but harder. The slope then followed the dip of the sandstones until it abutted upon a dyke of trap which barred further progress for the time.

A larger shaft, 7'×8', was sunk in November, 1872, (No. 3.132 B) and is now in operation by M'Cormick & Co.

The lease was made by the school trustees to Messrs. Altland, Beitzland & Hetrick in 1871, for 5 years.

It was re-leased in 1872 by the same parties for ten years. Mr. Hetrick retired a few months afterwards, selling his interest to Mr. Altland.

M'Cormick & Co. bought Mr. Beitzland's interest. The present proprietors of mining rights pay 85 cents per ton to the trustees of the school board, with the guarantee that this royalty shall be paid upon at least 500 tons annually. Since the virtual ownership and direction of the mine by M'Cormick & Co. only the main shaft has been in operation.

At first this company paid to Mr. Altland 85 cents per ton for his interest in the ore and 85 cents to the trustees, making in all \$1 70 of royalties, but more recently the royalties were reduced to 60 cents to the trustees and 50 cents to Mr. Altland.

Sandstone carries the ore. The top rock is a light greenish gray hard sandstone, and the bottom rock bluish gray and very hard.

The trap rises and cuts off the continuity of layers along the dip, as shown in Fig. 1 and Fig. 2.

The ore lies between the sandstones in regular layers varying from 6 inches to 7 feet, with occasional sandstone partings. (See Fig. 1.)

The ore is frequently found continuing a short distance into the trap. The approximate position of the latter will be seen from the illustrations.

The boundary between trap and sandstone is very clearly defined.

Ore has also been found in the N. W. side of the dyke, but thus far not in paying quantities.

Dip of the sandstone N. W.— $31^{\circ}$  to  $35^{\circ}$ .

Both gangways have been driven almost level along the strike with the trap dyke as the hanging wall on the N. W. side.

Sixty feet down the shaft, and on a level 50 feet N. W. of it, the sandstone dips N.  $30^{\circ}$  W.— $30^{\circ}$ . The trap dips N.  $30^{\circ}$  W.— $30^{\circ}$ . The wall of trap is four feet thick. Thirty feet north of the shaft two or three yards of rock in contact with the dyke showed no ore, but the vein was proved from this point up to day and south to the shaft.

Five or six tons are taken out per day. Formerly more were extracted.

Thirteen hands are employed—nearly all in the mine. The ore is drawn out by horse whim in buckets. A railroad is laid in the gangways, and cars transport the ore from the headings to the shaft. The water is pumped out by a Hardwick steam pump. The accumulation of twenty-four hours is thus disposed of in two hours.

The ore, (which is all used by M'Cormick & Co. of Harrisburg,) is hauled to Dillsburg by private teams for shipment over the Dillsburg Branch of the Cumberland Valley Railroad to Harrisburg. The teams charge \$1 35 per ton, and carry 5 tons to a load per six horses. The ore is very micaceous.

Over 4,000 tons have been already taken out.

An analysis of the ore from the Mine Bank was made by Mr. David M'Creath, and resulted as follows:

	Per cent.		Per cent.
Iron sesquioxide.....	82.607	Metallic iron.....	57.825
Cupric oxide.....	0.222	Metallic copper.....	0.177
Alumina.....	4.843		

	Per cent.		Per cent.
Manganese sesquioxide,	0.041	Metallic manganese....	0.029
Lime.....	0.760		
Magnesia.....	0.918		
Sulphuric oxide.....	0.150	Sulphur.....	0.060
Phosphoric oxide.....	Trace.	Phosphorus.....	Trace.
Carbonic oxide.....	0.123		
Water.....	1.277		
Insoluble residue.....	9.530		
Sum.....	100.471		

On Solomon Greist's property, on the Carlisle road, and on the west flank of the Mine Bank Ridge, large boulders of ore are to be observed lying loose.

About three-fourths of a mile E. of the Mine Bank, a red sandy shale dips N.W.  $15^{\circ}$  on the lower part of Mine Bank Ridge. The upper part of the ridge is composed of a yellowish gray rock of this same nature.\*

*Franklin Cookson's Exploitation Pit. (XIX, 42. No. 157.)*

Mr. D. Altland sank a pit on Mr. Cookson's farm last August. The opening is through a hard and fine-grained sandstone, much of which was coated with micaceous ore.

The dip needle showed a deflection of  $2^{\circ}$  North. A bed of ore is said to have been struck at 8 feet below the surface which measured 2 feet to 2 feet 4 inches in thickness. East of the opening about 20 feet an outcrop of hard mud-rock dips about north-west, strength uncertain.

A magnetic ore from the farm of Mr. S. Marsh, about  $1\frac{3}{4}$  miles south-east of Wellsville, was analysed by Mr. D. M'Creath and yielded—

	Percent.		Percent.	
Ferrous oxide.....	20.442	{		
Iron sesquioxide.....	68.142		Metallic iron.....	63.600
Alumina .....	3.515			
Manganous oxide.....	0.278		Metallic manganese... ..	0.216
Lime.....	1.570			
Magnesia.....	0.277			
Sulphuric oxide.....	0.225		Sulphur .....	0.090
Phosphoric oxide .....	0.448		Phosphorus.....	0.098
Insoluble residue.....	5.310			
Sum.....	100.207			

Mr. D. Altland reports that he has followed the range of the Mine Bank ore about seven miles S. W. into Adams county, and four miles N. E. by means of numerous outcrops and trial shafts. He asserts that a ridge is continuous for this entire distance, (11 miles).

*W. R. Smith's Exploitation Pits.* (XIX, 90. No 119.)

Situated about one mile north of the junction of the Little Conewago and Bermudian. The openings were made in January, 1875, and are two in number and about 8 feet deep. The first three feet was through a very hard blue mud-rock, then through a soft greenish sandstone in which its ore was found in seams of from 1" to 8" in thickness.

The ore does not generally affect the magnetic needle, but some specimens are magnetic.

The rock in the pit is said to dip N. 20° W.—45°.

A crude observation made it N. W.—20°.

Some micaceous and magnetic ore were found among the sandstone.

The east flank of a spur of the Black Ridge, west of W. R. Smith's, is composed of doleritic trap.

*Jacob T. Smith's Exploitation Pits and Shaft.* (XIX, 94. No. 158.)

Situated about three-fourths mile south-west of W. R. Smith's at a sharp bend in the Bermudian. The mining rights were leased and some pits dug by Mr. Wells, of Wellsville, one year ago. A shaft 35 feet deep was driven through sandstone and hard, indurated mud rock, the latter occurring in the upper part. Some fine specimens of micaceous ore were obtained here. A slope penetrates the rocks at a sharp angle north 30° west. The general dip of the measures is north 45°, west—30°.

These openings are all more or less filled with water at the present time.

A tunnel has been driven in on the adjoining Hess property. Very little if any of the ore showed magnetism.

About quarter of a mile west of Mr. J. Smith's house Mr. J. Drownson sank a slope, from which were extracted yellowish green sandstone more or less filled with micaceous scales. The shaft sunk by J. Smith is about 150 feet south-west of this.

In the shaft 12 feet was driven through various forms of mud rock, when 8 to 10 inches of micaceous ore are reported to have been found beneath, which was an impure limestone, stained black.(?)

The dip here appeared to be N. 15° W.—45°.

At the Bermudian, just below here, the rocks are well exposed, dipping N.  $30^{\circ}$  W.— $35^{\circ}$ . On the strike of this bed of ore, and where it should appear on the side of the deep cutting made by the Bermudian creek, two exposures of double yellowish green sandstones, in each case the layers separated by about  $1\frac{1}{2}$  feet of softer rock, occur on the hillside, with an interval of 50 feet between them; but in these instances the gangway appear to contain no ore, while at the shaft it is in very similar material that the ore was found. This offers a good illustration of the capriciousness of these deposits, which are neither constant in the direction of dip nor in that of strike.

Mr. Abraham Nickey opened a shaft on his farm, adjoining that of Mr. Smith's, and sank for 25 feet. Some piles of ore, said to come from there, were found by the side of the road near Mr. Smith's gate post. It does not differ in general appearance from that which Mr. Smith obtained.

## CHAPTER IX.

*Iron Ore Banks on the N. W. Flank of the South Mountain, in Cumberland and Franklin Counties.*

*Medler & Saylor's Bank. (XX, 48. No. 159.)*

This large excavation lies close alongside that of the Thomas Iron Company, and separated by it from the road. It is a little over a mile south-east of Papertown. Its area is over two acres; its depth below the surface 30 feet on its south-east side and 20 feet on the north-west.

It was originally opened thirty years ago by Geist & Krauft, who took out very little ore, and the mine remained idle until 1870, when Messrs. Medler & Saylor took the work in hand. It was leased from the Paper Company of Papertown, which owns the property, to which a royalty of 75 cents per ton is paid, with the agreement that 4,000 tons shall be annually taken out.

This company stopped work last fall, having up to that time taken out 40,000 to 50,000 tons. The average daily yield is 70 to 80 tons.

Forty-five men are employed and one 35-horse power engine, consuming three-fourths ton anthracite per day. The wages were \$1 40 per day, up to 1874, since which time \$1 00 has been paid. The engineer receives \$40 00 per month. The pump shaft is 40 feet long. Two Thomas washers are employed. Water is plenty, and is obtained from mountain springs and from a back creek. Medler, Saylor & Co.'s lease runs from 1870 for fifteen years. The appearance of the strata exposed in the banks of this mine resembles that in the Thomas Iron Co.'s mine.

The mine is not at present wrought.

*Thomas Iron Co.'s Bank. (xx, 4. No. 160.)*

Situated 200 feet north-east of the last named. It was opened about five or six years ago by Zachariah Boyer. It has been wrought for the Thomas Iron Co. for the last 18 months, Mr. Jos. Kirkslager having had possession of it between the times of its occupation by Mr. Boyer and the Thomas Iron Co. All the leases are from the Paper Co., of Papertown, which owns the property. Mr. Boyer paid 75 cents per ton to the Paper Co. The Thomas Iron Co. paid 40 cents. The average production is said to have been about 30 tons per day, but the mine is said to be now nearly exhausted. One washer and one two-horse power engine are employed.

Plenty of surface water for washing was obtained from a mountain stream. The bank was drained through a tunnel in which a railroad connected the bank with the South Mountain railroad. At present it is no longer wrought and is half full of water. Its area is about  $1\frac{1}{2}$  acres.

These Mount Holly ore banks, taken together, occupy two acres, more or less, (see map,) and are very large excavations. In the south-east heading of that one nearest the road the edges of the slates, now converted into clay, are plainly visible, and appear to retain their shape and position, with a dip of W.  $30^{\circ}$  N.— $55^{\circ}$ .

Bands of testaceous limonite are interbedded with the slates or are concretionary in character. The walls of the bank are about 40 feet high. At the north-west side, where the inclined railroad is situated, these clays are of pink, white and yellow color, are much convoluted and appear to roll with north-west and south-east dips.

Some red oxide of iron is mixed with the ore and stains the clays in places a brick red, but not a great deal is now visible. The bank has been closed for about one year.

An analysis of a number of the best specimens which could be obtained from this bank gave Mr. D. M'Creath the following results:

	Per cent.		Per cent.
Ferrous oxide.....	—		
Iron sesquioxide.....	46.214	Metallic iron.....	32.352
Alumina.....	2.654		
Manganese sesquioxide..	1.944	Metallic Manganese...	1.354

	Per cent.		Per cent.
Lime .....	0.260		
Magnesia.....	0.540		
Sulphuric oxide.....	0.222	Sulphur .....	0.088
Phosphoric oxide.....	3.472	Phosphorus .....	1.516
Water .....	9.840		
Insoluble residue.....	34.840		
 Sum.....	 99.986		
Undetermined and loss..	0.014		
 Total.....	 100.000		

Of course this will not furnish a correct idea of the average value of the ore while the mine is in active operation, because the wash of the rains will have both added unduly to the residue and reduced thereby the per cent of metallic iron. The phosphate present being very insoluble also are more concentrated in their surface specimens than in the commercial ore.

*Widow Bruch's Ore Bank. (XX, 67—XVI, 75. No. 151.)*

Situated about  $1\frac{1}{2}$  miles south-east of Idaville, in Huntingdon township, Adams county. The main excavation covers about half an acre, but has now almost entirely fallen shut. From Mr. Benj. Asper, who lives on the adjoining property, the following facts were ascertained:

Matthew & Duncan opened the property about 40 years ago. The ore was used in the old Whitestown furnace. The deposit (of which the outcrop is seen yet in the road) proved tolerably regular at first. The bank was dug about 50 feet deep and a drift was commenced at the bottom. Some of the ore was washed, and Mr. Asper thinks it was magnetic. It was hauled out by hand windlass and all sent to Whitestown (or Idaville). The mining operations were seriously interfered with and finally stopped by the encroachment of the water on the works. It was made into pigs and sold from Whitestown.

A new place behind the barn was opened 3 years ago. The old bank was wrought till 20 years ago.

The ore in the old bank is said to be at present exhausted.

Peter Dalhammer's property lies south of the bank. Ore is found lying about the surface. A great deal of trap is found lying along-side the road. Mr. Dalhammer reports the presence of a dyke in place in the field to the west. A trial shaft sunk in the orchard revealed large masses of ore.

*Chestnut Grove Furnace, near Whitestown, (Idaville,) Adams Co.  
(Information Derived from Mr. C. Wharton).*

This furnace was built in 1837, by Duncan & Mahon.

The dimensions were,

Height.....	30
Boshes.....	8'

It was used solely as a cold blast furnace, and was blown at first by the old Dottener tubs, which only blew one way. The ore was obtained from a bank about one mile south-east of the furnace, and was purely magnetic and of very great richness. The water power was limited, so that as a consequence with light power, weak blast, refractory ore, and a low stack, the fact that the furnace often chilled is not to be wondered at. In fact it never cleaned its hearth out well, and the slag was largely mixed with iron. Owing to the above fact, the owners could do nothing with it, and it came into the hands of Johnston & Lyons, and then to Mr. Johnston alone.

The latter was equally unfortunate in his attempt to make the furnace pay, and it was finally bought by Charles Wharton, who had it in operation from 1850 to 1855, and again from 1858 to 1861. Since the last date, although the property of Mr. Wharton, the furnace has been run by other persons, and (up to the panic of 1874, when it was blown out,) without pecuniary success.

The furnace was in operation altogether about 25 years. After Mr. Wharton assumed the management he got magnetic ores from Dillsburg and limonite from Mt. Holly.

The furnace is now partially dismantled and idle.

The average consumption of fuel was 600 bushels @ 5 cents per bushel delivered at the furnace bank.

*Albert Ore Bank, (near Whitestown)*

Situated about 1 mile S. E. of Idaville.

It was leased by Duncan & Mahon, and afterwards by Johnson and Lyons, up to about 1840. The character of the ore was decidedly magnetic. The average daily yield of the mine was ten tons per day, of which one-third was lump ore and was burned, the balance was wash ore.

The employees of furnace and ore bank together, were as follows:

Founder.....	1
Keepers.....	2
Gutterman.....	1
Fillers.....	2
Bankman.....	1
Coal stacker.....	1
Blacksmith.....	1
Ore bank hands.....	15
Choppers and colliers.....	40
Teamsters.....	7 (half of the year.)

Total number of hands..... 71

An engine of 15 horse power was erected in 1851.

The average quantity of fuel consumed daily was 600 bushels. There was no machinery of importance.

For 15 years the product of the furnace was sent by wagon to Carlisle at a cost of \$1 per ton. During the last five or ten years it was carted to Hunter's Run Station, on the South Mountain railroad, 4 miles distant, for which 50 cents per ton was paid. This would amount to  $12\frac{1}{2}$  cents per ton per mile.

Five teams were owned by the company and five were hired by the load.

The Albert mine has been abandoned for many years, owing to the expense of mining.

Work was impeded before it was entirely stopped by an excess of water, though it is probable that with modern appliances the difficulty could be overcome.

The ore was taken out altogether by cart.

In the opinion of Mr. Wharton, the Dillsburg banks are (to some extent at least) stratified, but often run into clay. The Albert ore seemed to be merely a nest or pocket of some thousands of tons, with no stratification and no more ore in the neighborhood.

During the time that a judicious mixture of the magnetic and hematite ores was made, guided by an extensive experience of the properties of the Dillsburg and Mt. Holly ores, the iron manufactured was of superior quality for boiler-plate and other purposes for which great tensile attributed strength is required. Its possession of these qualities is by Mr. Wharton to the magnetic ore.

*Centre Mills Ore Deposits. (Information derived from Mr. Chas. Wharton.) (No. 163.)*

Centre Mills is a small settlement lying about  $2\frac{1}{2}$  miles south-east of Bendersville, at a point where the Idaville-Gettysburg road crosses Opossum creek. In 1864 ore was found on several farms in the vicinity of this settlement.

A vein (bed?) was found from 15 to 24 inches thick, dipping at an angle of about  $45^{\circ}$ , and continuing below the water level so far as to render it impracticable to mine it economically on account of the intrusion of water. The ore was of fine quality; in fact too rich to work without admixture with a leaner ore.

The following letter from Dr. Genth (kindly furnished me for publication by Mr. Wharton) will give the chemical character of the ore:

C. A. Poizat & Co., }  
108-112 Arch St., }  
Philadelphia. } "PHILADELPHIA, July 25, 1868.

"Mr. Chas. Wharton, Esq., 225 N. Third St., Phila. :

"DEAR SIR :—An average sample of the two lumps of magnetic iron ore, which I have examined at your request, contains 67.97 per cent of metallic iron, no sulphur and 0.17 per cent phosphoric acid, equal to 0.07 per cent of phosphorus. It contains also a minute quantity of manganese.

"Yours truly,

"F. A. GENTH."

This ore lies regularly between a continuous roof and floor, but its extent is not known.

Mr. Wharton adds that owing to the thinness of the seams (15 to 24 inches) it was too expensive to mine, but the hanging and foot walls were maintained throughout the entire course of the exploitation.

The following is a partial analysis by Dr. Genth of the pig made from this ore:

C. A. Poizat & Co., }  
108-112 Arch St., }  
Philadelphia. } PHILADELPHIA, Oct. 21, 1868.

Charles Wharton, Esq., 225 N. Third St., Phila. :

DEAR SIR :—The sample of cast iron which I have examined at your request contained—

Phosphorus.....	0.147
Sulphur .....	0.026
Silicon.....	0.560

Yours truly,  
 (Signed)

F. A. GENTH.

*Pine Grove Ore Banks and Limestone Quarries and Furnace.*  
 Are situated at the terminus of the South Mountain railroad, in a valley between the main ridge of the South mountain and a couple of outlying spurs, about twelve miles south-west of Carlisle, in Cumberland county.

*The Thomas Iron Co.'s Ore Bank. (XX, 92. No. 164.)*

Situated on the side of the mountain, about three-fourths of a mile south of the furnace. It was opened in 1874, and work was continued for several months, but the ore had not been used up to September, 1875. The general dip of the ore was said to be south-east and into the mountain. The ore is to be washed at the mine. Twelve men are employed and one engine of 40-horse power. The ore is to be smelted at Pine Grove Furnace. The ore was wash or screen ore. There is said to be a large body of ore not yet reached underlying the present workings. Six to ten feet of stripping overlies the ore. Test pits have been sunk from 50 to 100 feet above (south of) this bank, in which limestone has been found. The shafts have now fallen shut.

The bank in its present state lies on the north side of the Bendersville-Pine Grove road, and about three-fourths of a mile from the furnace erected at the latter place. Its area covers about one-fifth of an acre. The walls are 25 to 30 feet deep through loose clay and rock fragments. The ore is a testaceous and concretionary limonite, in which much red oxide is intermixed. The seams appear to be lying in their natural positioin as evidenced by the yellow and white plates of clay which were found to cut the walls of the bank.

One of these seams appeared to dip N. W.—?, but this was very uncertain. Many instances might be mentioned where the loose edges of such soft seams of rock bend downwards in time so as to form a minute anticlinal roll whose axis is a very few feet inside of the exposed wall, so that while to the observer facing such a wall the clay layers seem to be dipping to-

wards him, on removing a few feet of this wall the dip is proved to be away from him.

*Limestone Quarries of the Thomas Iron Co. (XX, 94. No. 164 a.)*

Two large quarries lie about a thousand feet south-east of the village of Pine Grove.. The northernmost has an area of about three and a fourth acres, and the southernmost (distant only 150 feet) of a little more than five acres. They were opened many years ago, and are now leased from the Thomas Iron Company by Mr. Chas. Stewart, who pays a royalty of one cent per bushel. The dips obtained in a series of small quarries west of the south quarry were, S.  $60^{\circ}$  E.— $30^{\circ}$ ; S.  $30^{\circ}$  E.— $40^{\circ}$ ; and S.  $30^{\circ}$  E.— $45^{\circ}$ .

Limonite was taken out of these larger excavations many years ago, one block thus taken out weighing 30 tons. The limestone in these quarries is whitish blue, yellowish, and bluish white. It is said to be very pure and good. Limestone is said to have been found in place one-half mile up the mountain side from this quarry.

NOTE.—Analyses of this limestone will be found on another page of this report.

*Sam'l. Wolfe's Ore Exploitation Pits. (XXIV, 42. No. 165.)*

Situated about a mile N. W. of Greenwood, in Franklin county.

A small shaft was sunk by Mr. Wolf two years ago for ore.

Soil and cover.....	2'
Wash ore (and clay?).....	17'
Reddish and yellowish clay .....	2½'
Total deposit.....	27½'

Mr. Wolf reports that float ore of very good quality was found underlying the entire farm.

*Michael Good's Ore Bank. (XXIV, 52. No. 166.)*

Situated at the point where Cold Spring crosses the Scotland road. It was opened in the summer of 1873, and was 23 feet deep. Ore was struck about 4 feet below the surface, and the bottom of the deposit has not yet been reached. [Note.—The ore which Mr. Good here speaks of is undoubtedly wash ore scattered through the clay and soil.] The ore has no decided

shape. Four hundred and thirty-two tons were taken out. M'Cormick & Co., in Harrisburg, received the first 150 tons; the remainder was sent to the Franklin furnace, 11 miles west of Chambersburg, and of which Hunter and Spring are the owners. The ore sold for \$3 per ton at the bank to the above persons.

It is washed at the mine by water power, of which there is plenty in the vicinity. The washer is a single row of 117 blades. Eight hands are employed in the bank when it is in full operation, at \$1 25 per day.

An analysis of the ore from this bank made by Mr. D. M'Creath is as follows:

	Per cent.		Per cent.
Iron sesquioxide.....	76.571	Metallic iron.....	53.600
Alumina.....	5.010	Metallic manganese...	0.273
Manganese sesquioxide..	0.392		
Lime.....	0.200		
Magnesia.....	0.281		
Sulphuric oxide.....	0.185	Sulphur.....	0.074
Phosphoric oxide.....	0.409	Phosphorus.....	0.179
Water.....	10.980		
Insoluble residue.....	6.100		
<hr/>			
Sum.....	100.128		

The ore was a limonite.

The mine has not been operated since last fall. The pump is a four inch square plank shaft with sixteen inch stroke and eight strokes to the minute. It is only required for one hour per day to keep the mine dry. The shipping to the (wash) ore is about 4 feet thick. About one-third of the yield is lump ore.

An analysis is said to have given 58.56 per cent of metallic iron.

This analysis is as follows:

	Per cent.
Ferric oxide.....	83.67
Silica.....	12.02
Water .....	3.97
Lime.....	trace.
<hr/>	
	99.64

This analysis was made for Mr. Good, by Chambers & Nixon, of Chambersburg.

See Page 281 C.

Fig. 3

Second Geological Survey of Pa.

HORIZONTAL PROJECTION  
IN THE WORKS IN  
THE MINTER MINE,  
FRANKLIN TOWNSHIP  
ADAMS CO.  
Dip at 28° N.W.  
Copied from Drawing by David King 1875.

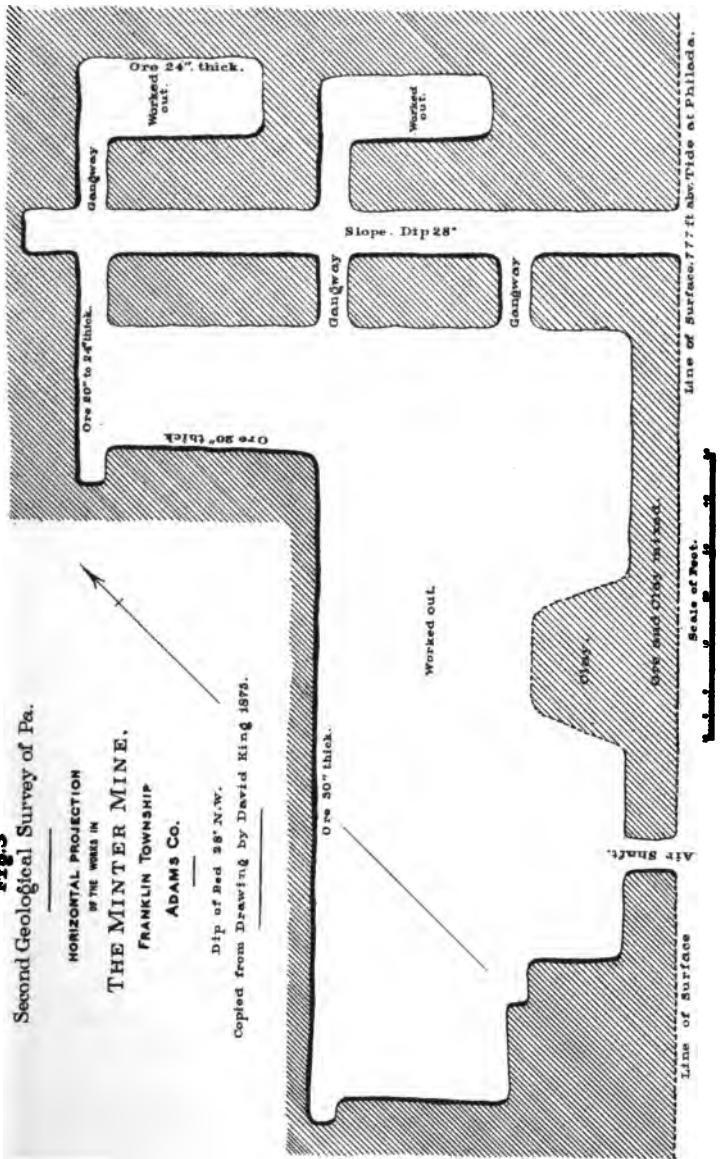


Photo-Tide & Printed by J.H. Carr, 60 Jayne St. Philadelphia.



Three hundred feet S. of E. of this pit was a trial shaft sunk  $2\frac{1}{2}$  years ago, of which the following is the record:

Soil, sand and gravel.....	13'
Ore.....	5'

The bottom of this shaft was still in ore.

*G. M. Howell's Ore Opening. (XXIII, 32.)*

This opening is made on the farm of Mr. Howell, one-half mile north-west of Reynold's Tavern, and about  $1\frac{1}{2}$  miles W. by N. from Gettysburg.

The opening is  $6 \times 4$  feet in area, and is at present nearly filled with water.

The debris shows grayish shale and sandstone and fragments of trap.

No ore is at present visible, but Mr. Reynolds, of the hotel, exhibited a quartzose limonite resembling some of the specimens taken from the Pigeon Hills, which he asserted was taken from there. The first pit, (in a private lane by a walnut tree,) gave a dip of S.  $25^\circ$  E— $60^\circ$ .

*G. Cole's Ore Opening. (XXIII, 46.)*

About  $1\frac{1}{2}$  miles from Newman's, on the Coles' Valley road, Mr. Benj. Steward opened a pit in 1873, but did not lease the property for himself.

The agent of M'Cormick & Co., Mr. Findlay, on behalf of Pine Grove furnace, and Mr. Weaver were inspecting the property with a view to leasing it, but the Brothers Coles determined to work it themselves. A number of holes were sunk, but no ore was found except in the place where it was first worked. One party offered 50 cents royalty and another 62 cents. The excavation is about 4 feet deep. The ore is apparently a very pure, crystallized, micaceous specular ore, occurring in milk quartz and in orthofelsite. It occurs in large bunches of plates weighing several pounds, and is generally free from magnetism.

The country rock is a light colored orthofelsite, which is temporarily replaced by unctuous slates a short distance south of Mr. G. Coles's farm. Mr. Coles reports that in several of the pits dug to prove this ore a light white powdery material was taken out from a few feet below the surface of the ground.

This ore will be more especially noticed in connection with its analysis in the report for 1876.

Some of these lumps of quartz weigh over a ton.

*Pond Bank. (XXVII, s. No. 167.)*

Situated about  $6\frac{1}{2}$  miles south south-east of Chambersburg, Guilford township, Franklin county. It has been for some years unworked. At present it is a very large irregular or pear shaped excavation, covering about  $2\frac{1}{4}$  acres, and with a bank 35 feet deep at the northern end. The debris on the side of the banks consist of a "flaky" sandstone, *i. e.*, an arenaceous rock, with a suggestion of slaty structure from the thin plates into which it breaks. These thin plates are largely charged with iron oxide and are intermixed with testaceous ore. Other portions of the debris are quartzite, with occasional thin plates of pyrite in its upper surface.

About 1,200 feet due west of this large excavation is a quarry of limestone in which the dip is S.  $25^{\circ}$  E.— $80^{\circ}$ .

Ten feet further S.  $25^{\circ}$  E. of this point is doubtful exposures giving N.  $35^{\circ}$  W.— $70^{\circ}$ . Even if not out of place the dip is evidently local.

On the present site of the bank but little can be observed but the fragmentary pebbles which compose its sides, intermixed with which are frequent specimens of hard, glassy, testaceous limonite (manganiferous?).

A stake on the surface is immediately above the point where the limestone was first struck in the drift.

About 100 yards N.  $8^{\circ}$  E. from here is a pit in which a quantity of lignite, containing fossils of nuts and deciduous wood was discovered a few years ago. Of course this deposit is very local and belongs probably to the newer Tertiary.

*Peter Comfort's Mine. (XXV, ss. No. 168.)*

Situated on the upper part of Marsh Creek, about  $1\frac{1}{2}$  miles N. N. W. of M'Knightstown. The opening was made by the Wrightsville Iron Company in the spring of 1867, from which date a lease of 25 years was obtained at a royalty of 30 cents per ton. The mine has lain idle since the summer of 1874. The southernmost slope of the group of openings being the last which was wrought. The slopes are sunk along the

bedding of the rock to the depth of 125 feet, with drifts in each direction from the bottom.

Several additional slopes have been from time to time constructed, but all are abandoned at the present time. The ore is magnetic. The bed of ore is about 2 feet thick in the last slope in operation. Numerous slopes, pits and small shafts have been opened over an area of about seven acres from all of which more or less ore has been obtained.

Also a large amount of float ore of good quality is found in the soil of the neighboring fields. Ore was obtained from the open cuts of this character.

The ore was shipped by team to Gettysburg—distant, seven miles, @ \$1 65 to \$1 85 per ton. Four or five tons constitute a load. The ore was hoisted by a windlass worked by horse power. No other machinery was used. The timbering has rotted and the underground works are out of repair.

*Adam Minter's Mine.* (XXV, 32. XVI, 47. No. 169.)

Situated 800 feet N. W. of the Comfort Mine. M'Cormick and Co. were induced to look here for ore in the summer of 1874, from the developments previously made in the adjoining (Comfort) property.

The mine was opened and machinery erected, and ore was extracted at the average rate of \$1 96 per month. Eleven men were employed—9 in the mine and 2 outside, besides the boss. The wages to miners were \$1 20 per day of ten working hours. The engineer received \$1 60 per day, and the boss, \$75 per month. For running the engine till midnight the engineer was paid for  $1\frac{1}{2}$  days.

They usually do not pump at night, but in August, 1875, they were compelled to do so on account of the leakage of surface water into the mines due to the excessive rains of the previous few weeks.

One 15-horse power engine is at the mine.

The ore occurs in irregular beds. The levels at which ore was being taken out at the above date were from drifts at 47 feet and 132 feet on the slope. At the former level a drift has been driven 96 feet east of south. At the 132 foot level the ore is about 2 feet thick. For about 20 feet on the slope the ore thickens to  $2\frac{1}{2}$  feet.

First level : In the first level, about 52 feet from the slope, there is a clay filling, which cuts out the ore and takes its place between the wall rocks for five or six feet. Beyond the clay the ore widens out, and the drift ends in the swell.

Second level : The second level is begun 79 feet down the slope, and is driven in both directions, the distance on its north-west side being about 25 feet.

To the south-east the level was driven 179 feet to where the ore was cut out by soft, slaty rocks of reddish color and unctuous to the touch. These slates were penetrated for 3 or 4 feet, when work was stopped by order of Mr. King, the superintendent for M'Cormick & Co.. The ore is otherwise very regular in this level.

The specimens of foot and hanging walls shown by Mr. Jenkins were calcareous conglomerate, in which the pebbles were small.

Third level : The third level is 40 feet below the second, and at the date of its inspection (August, 1875,) the south-east drift was 17 feet, the ore holding out well, and the north-west drift but 5 feet.

The ore promised well to the bottom of the slope at this time.

During the year that the mine was worked about 2,500 tons were extracted and shipped *via* Gettysburg to Harrisburg. It has lain idle since September, 1875.

At first anthracite was used as the fuel, but after June 1, 1875, wood was substituted for it. The consumption was  $15\frac{1}{2}$  cords from June 1st to August 5th. The water was pumped by a Smedley pump, but the latter was not in repair. The discharge pipe was 3 inches in diameter, diameter of cylinder 4 inches ; 1 foot stroke, 25 strokes per minute.

The teams were hired and hauled the ore to Gettysburg for \$1 20 per day, making one trip. Two wagons did all the hauling, the owners of which live in M'Knightstown. The wagons are loaded and hauled one and a half miles to the turnpike in the evening, and are started for Gettysburg early in the morning. The load is four to five tons, with five horses in one team and six in the other.

The cost per rail from Gettysburg to Harrisburg was not ascertained.

There was generally no trouble from water.

The hoisting out of the mine was done in small cars.

The roof of the slope is supported by a single row of timbers down the middle.

The slope is 20 feet wide and 5 feet high, and the track is 7 inches in width. The slope at the surface is  $22^{\circ}$ , but a short distance in, and to the bottom,  $28^{\circ}$ .

At the heading of the first level the sandstone shows a cleavage plane more distinctly marked than the place of bedding, which dips S.  $45^{\circ}$  E.— $32^{\circ}$ .

The sketch of the workings made by Mr. Dan'l King accompanies this report by the kind permission of Mr. H. M'Cor-mick.

The following is the result of analyses of this ore from the upper and lower levels made by Mr. Ford at Harrisburg.

#### *Minter Mine.*

##### UPPER LEVEL.

	Per cent.	Per cent.
Ferrous oxide.....	12.214	{ .9.5
Sesquioxide of iron	53.376	{ 37.4 } 46.9
Ferric sulphide....	0.050	
Alumina.....	4.424	
Manganous oxide .	0.896	Metallic manganese.. 0.700
Lime.....	1.868	
Magnesia.....	4.198	
Phosphoric acid...	0.128	Phosphorus ..... 0.056
Potash and soda...	0.953	
Water.....	5.000	
Silica.....	17.024	Sulphur..... .... 0.027
Arsenic acid.....	Not estim'd.	
Sum.....	100.131	

##### LOWER LEVEL.

	Per cent.	Per cent.
Ferrous oxide .....	15.429	{ 12.0
Sesquioxide of iron	48.565	{ 34.0 } 46.00
Ferric sulphide ...	0.009	
Alumina .....	3.486	
Manganous oxide ..	0.617	Metallic magnanese.. 0.481
Lime... .....	4.746	
Magnesia .....	6.866	

	Per cent.		Per cent.
Phosphoric acid...	0.160	Phosphorus .....	0.070
Carbonic acid.....	1.375		
Potash and soda...	1.143		
Water.....	1.888		
Silica.....	15.466	Sulphur.....	0.005
Arsenic acid.....	Not estim'd.		
	<hr/>		
Sum.....	99.750		
Undetermined and loss .....	0.25		
	<hr/>		
Total .....	100.000		

*MacNair's Ore Openings.*

These openings are upon the farm of Mr. MacNair, about  $5\frac{1}{2}$  miles from Gettysburg and  $2\frac{1}{2}$  miles from Emmetsburg. Ore had been found on the property of Mr. Rhodes, adjoining, but not in paying quantities. Mr. Robt. MacNair states that Jacob Peters brought a dip needle to the farm, and said that the corner of the corn field was the only place in all the country round where the needle was measurably deflected. He sank a small shaft about 8 feet deep and found about  $\frac{1}{2}$  bushel of magnetic ore.

The principal rock thrown out of this pit appears to be a coarse-grained dolerite, though some of the feldspar looks under the magnifying glass like orthoclase and some of the amphoteric mineral like hornblende. (These specimens will, however, be analysed and studied under the microscope.) Another neighboring rock is a compact, brittle rock, with conchoidal fracture, and containing, like a porphyry, prisms of a white substance, as yet undetermined.

At the mouth of pit No. 1 are blocks of a greenish trap, (?) called copper rock or *copper stone* by the inhabitants, in contradistinction to *iron stone*, which is their name for the common dolerite.

One hundred yards, more or less, west of Mr. MacNair's house, on the lane, a hard, compact, gray sand rock crops out, appearing to dip vertically, but in fact dipping about W.  $10^{\circ}$  N.— $20^{\circ}$ . About 50 feet west of this is a finely laminated rock, in which the cleavage seems to dip S.  $10^{\circ}$  E.— $85^{\circ}$ .

(An analysis of a specimen of the ore furnished by Major H. S. MacNair, of York, and stated by him to be taken from the MacNair farm, will be found on p. 75 of the Report of Progress for 1874.)

*Mr. George Krise's Ore Mine.*

Situated about one mile west by south of Mr. MacNair's. Mr. Krise states that in the spring of 1874 Mr. Wm. Letcher opened the mine and took out a quantity of ore. Mr. John Davis came from Winchester in the following spring. The opening is about 1,000 feet S.  $30^{\circ}$  E. of the house, and consists of three or four irregular pits lying along a line N.  $10^{\circ}$  E. perpendicular, to which a trench and pit were cut 25 feet to 30 feet W.  $10^{\circ}$  N. This represents the direction of the dip, and the strength is about  $30^{\circ}$ . (Country rock dips W.  $10^{\circ}$  N. — $30^{\circ}$ .)

The gangue is a banded sand rock, the separate bands being alternate layers of about one-half inch in thickness, of dark green, gray, and brick-red mud rock. The latter is of resinous lustre, and looks like shellac.

On some of the faces of this rock thin films of crystals of undetermined composition have been laid down. The surface of the ground sparkles with the fine spangles of these little crystals, which glint from the dirt with which they are mixed.

Twenty feet east of the opening a yellow and red shale is exposed in a gully, having about the same dip.

Parts of the machinery are lying around the abandoned mine.

Leases were taken on the farm adjoining properties through which the ore was thought to strike, viz: George H. Krise, Ross White, Flemman White, (close to Middle Creek,) and Jacob Iker. On the last farm they never opened, but the ore was proved to extend through the farms of the other two—it is said, of an inferior quality to that found on Mr. Krise's.

Mr. Krise dug a ditch and struck a body of good ore in the opposite direction, viz: S.  $10^{\circ}$  W.

He states, also, that Mr. King, for M'Cormick & Co., sank a slope some 90 feet, and while the deposit was followed for the

entire distance it was found to be irregular, occurring in nests and strings. Mr. Johnson, formerly the boss of the Minter mine, suggested drifting, but this was never done.

## CHAPTER X.

*The Mont Alto Furnace and Ore Banks.*

These are situated at the extremity of the Chambersburg and Mont Alto railroad, in Franklin county, Quincy township, about nine miles south-east of Chambersburg.

The works are owned, together with a large tract of timber land in the South Mountain, by Waterman & Co., and the direction of operations is confided to Colonel George B. Wiestling, who kindly furnishes the survey with the following statement:

“MONT ALTO, December 31, 1875.

“*Prof. Persifor Frazer, Jr.:*

“DEAR SIR:—In accordance with my promise, I herewith send some statements of our operations at this point:

“We adopted, and still resort to different modes in some localities, in testing the existence and extent of our ore beds.

“Some places we use a common spiral auger about four inches in diameter, with an extensible stock. The apex of a light tripod made with poles, serves to guide the auger, keeping it vertical. Two men with a wrench which fits square places on the stock do the boring, while a small sheave, or pulley block, fastened to the tripod with a rope and rough windlass barrel serves to withdraw the auger and borings.

“With this, two men can bore forty feet per day, if not hindered by large round stones, or lumps of hard ore.\*

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\*In a great majority of instances, however, we sink circular pits, about three or four feet in diameter. We prefer the circular section, as the pit is less likely to cave in; no timber or props being used in testing. These borings and pits are all numbered to correspond with similar numbers on map, and in “Exploration Book.” In this book a memorandum is made of each pit; the character of the material passed through in detail; the dip and such ex-

"Having selected a locality at which we propose opening a bank, and knowing from our tests that the ore is there, we resort to the auger and additional pits or drifts in order to make sure that we locate our machinery off the ore if possible. The ore from borings and pits and drifts, we in some cases subjected to analysis; in other cases we secured enough from a vicinity to try in our blast furnace, forge and rolling mill. In this case, samples of the iron thus made are shelved, labeled with the number of pit or pits from which the stock came.

"Some of the analyses were as follows:

	MINES.				
	No. 3.	No. 4.	No. 5.	No. 8.	English or No. 65.
Metallic iron.....	46.27	51.86	51.39	57.27	37.25
Alumina.....		.70			
Carbonate lime.....	trace.	trace.			
Silica.....		16.30			
Water.....		8.20			
Sulphur.....	None.	None.	None.	None.	None.
Phosphorus.....	.15		.10	trace.	.64
Prot. manganese.....	.31		trace.	trace.	7.90

"The remainder in each ore, not given above, is chiefly siliceous matter and moisture.

"Ore has been mined at Mont Alto since 1808.

"I gave you the detail of Pit No. 96, in which a body of lignite was found, as well as specimens of the lignite.

"Our furnace stack was built in 1808, in the style then ruling. It is a stone stack, and was 31 feet high and 8 feet diameter of boshes, with two tuyères, when we acquired possession in 1864.

"Previous to 1864 the power was water. We placed flues on furnace top, thus raising her 6 feet, making height now 37 feet. We increased her diameter of bosh to 9 feet. (It is now 9½ feet.) We introduced a third tuyère, and put her in as good shape and condition as her age and the surroundings would

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planatory comments as seem desirable for future reference. The finding ore in a pit remote from others is, of itself, no evidence of the extent of the deposit. Neither does a pit disclosing only clay, prove the non-existence of ore. I have sunk one hundred feet deep in what proved to be a "chimney" of clay, getting from it not over a bushel of ore lumps, while three feet on either side of the pit, the ore proved to be abundant. Whether to persist in a given locality, or to abandon with a single or very few trials, is a question of judgment based on the surroundings, and what little of science we gather from books and contact with experts.

permit, and changed to steam power. We pay special attention to the proper preparation of the stock. The charcoal is handled with forks and the fine screened. The screenings are used for ore washing, generating steam at mines or in blacksmith forge.

"The limestone is broken in a Blake crusher to a uniform size with the ore, viz: from a hen's egg to a pea. I believe a perfect operation would require the ore, coal and limestone to be of uniform and the same size.

"The ore receives careful attention. I find different definitions apply to the term "clean ore" among iron masters. For instance, a quantity of ore may be perfectly free from adhering dirt, each separate piece perfectly cleansed, but if it have mixed with it pieces of sandstone or quartz, also equally clean of themselves, the ore is pronounced "not clean." Of course it may be extravagant to use ore thus unclean, especially if this foreign mixture is not required for fluxing. Again, if you take the perfectly cleansed ore, free from any foreign mixture of clean pieces of sandstone, &c., and bathe it in a solution of clay, or in white-wash, this would be rendering it unclean. This latter dirty ore would generally be regarded much more favorably than the first named. The ore itself being sometimes of a yellow cast, the thin coating of clay wash is not so easily noticed. The small quantity of dirt is looked upon as a slight affair, not necessitating much additional coal.

"Brown hematite wash ore is generally thus dirty. Just as the ore leaves the wash-trough it is treated to a bath of dirty or clayey water, and, as I say, is not strongly objected to, and yet I find this is a more objectionable form of uncleanness than the first.

"It is not the quantity of dirt, but the shape it is in, coating each separate piece of ore, stopping up the pores of the ore, preventing the proper preparation while descending, rendering it impenetrable by the gases, that makes it a far worse feature than if many times the bulk of the same or other objectionable material was intermingled with the ore.

"Even if the clay or lime is necessary as a flux, this way of introducing it is bad. And the wrong way is just as bad as the wrong thing.

"This receives our careful attention ; our ore goes in clean—not only washed, but rinsed in clean water. To accomplish this more perfect cleansing, we invented a shaking screen and attached it to our ore washer. It is inexpensive, works well, serving the purpose admirably, and is not patented. Thus the yield in the furnace closely approximates the analysis of a fair sample of ore, the fuel used is the minimum of its kind required, the quantity of flux used is known, the product of the furnace is increased and the quality of the product is improved.

"Our furnace works regularly and produces as much as, or more iron than any of her size, that I know of in Pennsylvania, using the same percentage ores and kind of charcoal.

"I add a statement from our blast book, giving her work for a week in August, 1875. (See page 261.)

"The ore used was from Mine 4. The charcoal varied in quality from hard and soft wood, but was better than our average.

"The foregoing is our best week's work. The average for this year is 90 tons product per week, requiring per ton of pig iron  $\frac{2}{3}$  tons ore, 120 bushels charcoal and 8 cwt. limestone.

"Although we have about 20,000 acres connected with the estate, and use our own wood, make the charcoal and haul it, yet charcoal varies greatly in quality from the different kinds of wood, from variableness of weather, difference in skill and care of colliers, and the same uniformity in work is scarcely attainable that should characterize anthracite furnaces.

"Our objective point, so far as the works are concerned, is a uniformly best quality of product for the purposes to which our iron is suited, and secondly, quantity and cheapness.

"You will readily perceive from the difference in the few partial analyses of our ores that we can make different kinds of iron, or iron suitable for different purposes—any of it would be "good."

"Consumers of iron are generally careless in the use of the terms they apply to it. Send the best Scotch Pig to a puddling mill or forge, and it would be condemned as "bad," unfit for use. The best Norway or Swedish iron would be just as unsuitable for the head of a railway bar, as cold short or red short iron would be for flange, plate or rivet rods.



" Pine wood has its valuable uses, just as has hickory or white oak, and I believe any iron may be good for some purpose. It is important to know what particular purpose a specified make is good for, and this largely governs its value. The best iron might as well be bad as be applied to some purpose to which it is unsuitable. Iron made from our No. 3 mine is strong and chills well, making it valuable for car wheels. That made from Mine No. 4, No. 8, Pond Bank, Mill Bank and others, more closely resembles Norway iron in its softness and tenacity, fitting it for rivet rods, flange plate and fire-box iron.

" We have a Steam Bloom Forge connected with our works, and manufacture blooms for the above purposes. The surplus pig iron, over what we consume in the forge, is principally consumed for car wheels, and until 1874, we were always closely sold up, and indeed found it impossible to fill all orders. We are proud of the reputation of our iron, and do our utmost in every department to improve it.

" Respectfully yours,

" GEO B. WIESTLING."

*Exploitation Pits in the Vicinity of Gettysburg.*

Martin, Barbehue & Koppe opened several small pits on M'Knight's Hill. At the time these were visited no ore was observed around the opening. The stripping was ten feet thick, and the excavation was alongside a wall of coarse dolerite similar to that occurring on Culp's Hill, and Round Top, &c.

This rock, which is dark colored by weathering, and hard and contains from 11 to 15 per cent of magnetic oxide of iron frequently gives rise to the belief that itself, as well as the adjacent rocks over which its debris are distributed, are ores. Indeed it may well be considered whether the constant and frequently large percentage of magnetic oxide in these specular ores is not mainly, if not entirely, derived from the disintegration of the traps which are generally to be found in this vicinity.

A couple of openings lower on the hill, out of which the rock has been taken by a windlass, are about 15 feet deep. In some of the fragments exhibited near these openings the trap is seen to increase in weight and magnetic force so as to prove a transition from the trap to a kind of magnetic ore.

*An Opening on Benner's Hill, East of Rock Creek,*

At the time this opening was visited it was nearly filled with water. The rocks thrown out show no indications of ore, but are principally indurated blue mud rock. On top of Benner's Hill is a quarry of loose and broken gray sandstone dipping N.  $25^{\circ}$  W.— $25^{\circ}$ . This stone was used for the foundations of the Methodist Church in Gettysburg.

In the gutters alongside the road leading from the top of Cemetery Hill, and near the Soldier's Home, many specimens of pyramidal epidote are to be found, varying in size from one-half inch in length, and one-eighth inch in thickness, to two inches long, and one-fourth inch in thickness.

Major Benner, of Gettysburg, has presented several of these very perfectly terminated to the survey.

*Exploitation Pits for Copper Ore.*

Copper ore has been recently discovered five miles east of Gettysburg, near Bonneauville, (Bonnaughtown, or Bonnaugh-

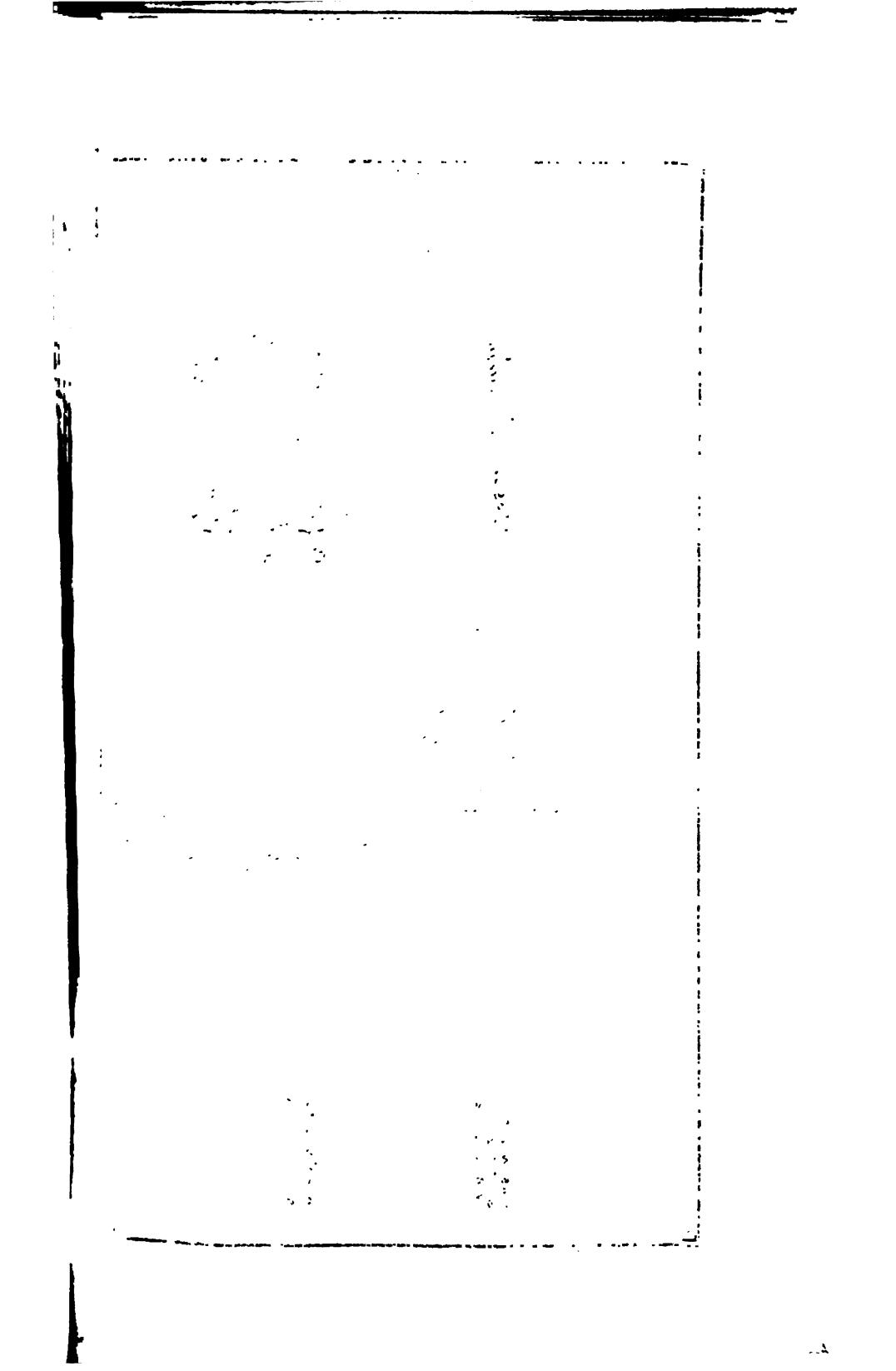
ville,) and at various other points in Adams and York counties.

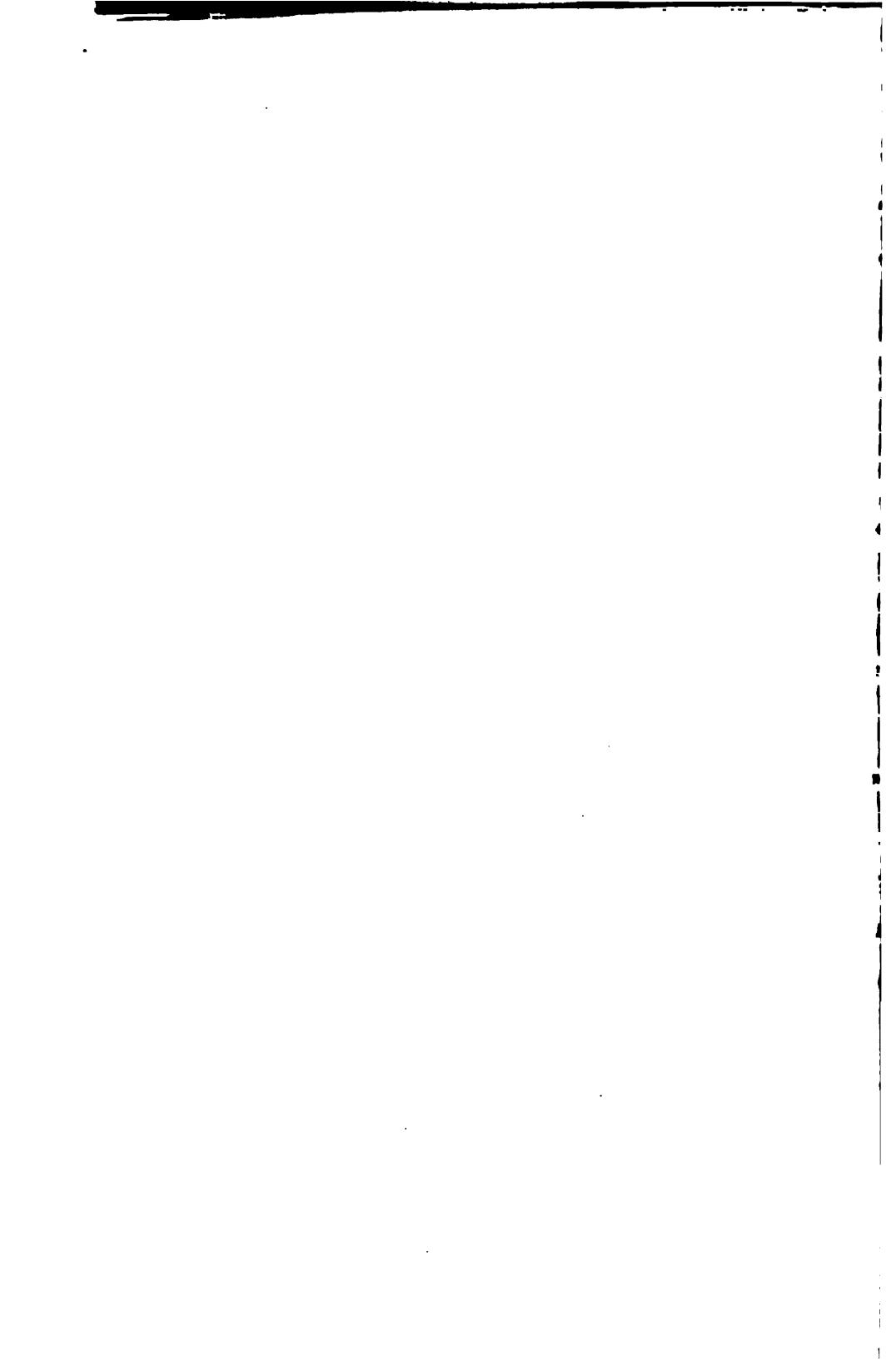
The out-crop of the ore near Bonneauville, like similar outcrops near Dillsburg, on the Bull Road in York county, and in many other places, is merely a bed vein of malachite of a few inches in thickness, from which a foot or more of both foot and hanging wall have been, to some extent, saturated with soluble salts of copper.

The farm on which this discovery was made is the property of Mr. J. L. Livers, whose house is nearly the western limit of the hamlet above mentioned. About 300 yards south of this house, and in the middle of a field, Mr. Livers ploughed up several specimens of green copper ore, and on digging discovered the vein. The Mesozoic rocks of this vicinity are very much broken. The most homogeneous layer of the strata is a red sandstone, which is hard and compact in blocks, which latter are unevenly divided by numerous cleavage planes. They dip north-west  $30^{\circ}$ .

Nothing has been done but the most superficial scratching of the surface, but the occurrence of float ore in the direction of the strike, for some distance each way on the neighboring farms, augurs well for the productiveness of this vein.

These localities will be commented on in a future report.





## CHAPTER XI.

## DESCRIPTION OF CROSS SECTIONS.

*Section No. 6.*

Section 6 runs S.  $47^{\circ} 30'$  E. from a point  $1\frac{1}{2}$  miles north of Dillsburg, across the belt of New Red Sandstone to Berler's cross-roads, and the eastern boundary of the same and a point located on the map of 1874.

The commencement is in the limestone conglomerate, (Potomac marble, (?)) which forms the north-west margin of the New Red Sandstone. Several conflicting dips were observed at the north-west end of Kuntz's quarry, and the difficulty of obtaining one entirely reliable here is very considerable. The first recorded is S.  $45^{\circ}$  W.— $24^{\circ}$ ; but at the same place, or so close to it as not to be susceptible of separate delineation on the map, is the dip of S.  $10^{\circ}$  E.— $40^{\circ}$ . Four hundred feet further on in the direction of the section is a dip in the same rock of W.  $8^{\circ}$  N.— $22^{\circ}$ , which clearly indicates a small fold towards the margin of the New Red.

About three-fifths of a mile over the section occurs a dip in altered Mesozoic greenish sandstone of W.  $25^{\circ}$  S.— $50^{\circ}$ . Within a few hundred feet of this occurs a gray limestone conglomerate, (partially altered by decomposition into a marl,) dipping S.  $10^{\circ}$  E.— $28^{\circ}$ .

Following this further in the direction of the section, and close by, is a conglomerate composed of fragments of the old chlorite and crystalline schists imbedded in calcareous matrix. This rock is quite commonly found in this vicinity; an entirely similar one is raised out of a shaft from a depth of 75 feet, near the Mumper & Logan mines.

The dip of S.  $10^{\circ}$  E.— $28^{\circ}$  not only renders probable the correctness of the somewhat doubtful dip with which the section

began, but proves a very considerable thickness of this component of the New Red Sandstone to have the unusual direction of dip to the south-east, and subtracts somewhat from the thickness of this formation here.

It has been assumed that this dip indicates a synclinal of *at least*  $1\frac{1}{2}$  miles between the exterior limits on the present surface, and in the absence of further recorded outcrops between the last mentioned dip and the few obtained at the mines east of Dillsburg, the structure would seem to suggest the placing of an axis somewhere near this point, because these synclinal troughs have heretofore been considered rare in these measures, and this would reduce the extent of this one to a minimum.

But 5,000 feet, or nearly a mile, further on the line of section, and 75 feet below the surface, and north-west of M'Cor-mick & Co.'s long cut, a conglomerate has been found in a bore hole very nearly resembling that just mentioned. Supposing the dip of this bed (as we must do) to conform to the dips of the measures immediately above it, the limits of this synclinal of limestone conglomerate would intersect the plane of the horizon at points nearly  $1\frac{1}{2}$  miles apart, or at the distance above given.

The limestone conglomerate *without* schist fragments (*a*) which was found in Kuntz's quarry, and which most probably underlies the limestone with schist fragments, (*d*), exhibits a roll in the quarry itself. The north-west dip which was the second recorded on this line (*b*) would bring it to the surface to sink again at some point not definitely ascertained, but further to the south-east (or between *a* and *c*). Again, the north-west dip of the altered sandstone close by the schist conglomerate (*c*) would cause that to sink to the north-west, and rise with the supposed, but not recorded, south-east dips, which probably intervene between it and the commencement of the line (*b* and *c*).

This structure, however indefinite, is something like that which must obtain in the portion of the section now under consideration, and must result in bringing the conglomerate nearer together (perpendicularly) than would be the case were the wave a simple synclinal from *a* to *d*.

Some idea of this perpendicular distance may be had by a comparison of the perpendicular distance of the limestone found in Bell's or MacWilliam's slope (which resembles that at *a*) from that just mentioned, which occurs 75 feet below the surface near M'Cormick & Co.'s cut.

This distance is about 1,400 feet, and the whole thickness of measures from the slope of the South Mountain to Bell's mine, or over a distance of more than two miles, only 2,400 feet, instead of 6,000 feet, as would be the case were the bedding regularly monoclinal.

Three dips obtained in the rock bedding where the mining of ore is being carried on (*e*) and to which the limestone with schist fragments, found at a depth of 75 feet, was adjusted, give N.— $28^{\circ}$  twice, and N.  $10^{\circ}$  E.— $20^{\circ}$ .

Two thousand feet further on the line, and a few hundred feet north-west of Grove's bank, a dip in altered Mesozoic sandstone of S. E.— $35^{\circ}$  seems to betoken an anticlinal between *e* and *f*, which, however, is rapidly succeeded by the dip of N.  $10^{\circ}$  E.— $24^{\circ}$  in the sandstone which accompanies Grove's ore. The projection of Price's ore on the line is made from a point too remote to serve as a guide to the structure even if an exposure were to be found here, which is not the case. At this point is the margin of a wide belt of trap which covers the whole country, to the exclusion of other rocks, for  $3\frac{1}{2}$  miles on the line of section, and for several miles north and south of it. But though this outburst of trap conceals from view the sedimentary members of the series of New Red Sandstones, there are indications from its observed position that some of these sedimentary strata had south-east dips. Such is an exposure (*h*) about a mile S.  $47^{\circ} 30'$  E. of the contact between trap and sedimentary rocks, (*g*.) where a coarse grained dolerite dips S.  $10^{\circ}$  E.— $30^{\circ}$ .

Of course it is not certain that the inclination of the trap was determined by that of the true bedding since it will be seen that in the case of a dyke near Dillsburg\* these traps frequently followed planes of cleavage ; but in this case both the direction and strength of the apparent dip coincide so nearly with that of true sedimentary rocks noted at the beginning of

\*See chapter on the geology.

this section, that the conclusion is almost forced upon us that this trap is a *fossil dip* of the New Red Sandstone, and indicates the position of things before the strata of the latter were replaced.

This trap outburst occupies a little less than  $3\frac{1}{2}$  miles of the gray sandstone. Here a greenish gray sandstone gives a dip of W.  $35^{\circ}$  N.— $40^{\circ}$ . Following this exposure is half a mile more of trap, and then a large clay deposit of Morganthaler's, which fills two or three fields of meadow land. Succeeding the clay is a certain magnetic ore, the analysis of which will be found in another place.

Here come in bluish shales and Red Sandstone dipping W.  $31^{\circ}$  N.— $20^{\circ}$  for 400 feet, after which, in the next 800 feet, nothing but an exposure of coarse dolerite was observed; and again a red sandstone with a dip of W.  $40^{\circ}$  N.— $24^{\circ}$ . Six hundred feet further on are found sandstones coated more or less with micaceous ore, on top of gray and greenish shales in which three outcrops not far apart, gave respectively, N.  $45^{\circ}$  W.— $16^{\circ}$ , W.  $40^{\circ}$  N.— $20^{\circ}$ , and a cleavage plane, E.— $85^{\circ}$ .

In the midst of this series occurs Corkson's ore. Its analysis will be found elsewhere. The locality is just north-west of the town of Wellsville, within the limits of which another sandstone exposure exhibits a cleavage plane of E.  $5^{\circ}$  S.— $85^{\circ}$ .(j) This new plane of cleavage which commences near Corkson's is found for a long distance further along our line, or to a point just south-east of the town of Dover, (l) beyond which no record of it was made.

A peculiarity of this plane is, that its direction of dip changes gradually and regularly from Wellsville to Dover, commencing with east and dipping at the latter town S.  $40^{\circ}$  E. Its steepness also varies, but not regularly. First it decreases to  $67^{\circ}$ , and then it increases to  $80^{\circ}$ , or the same angle which it exhibits when first mentioned.

If this plane be taken, a powerful thrust from the eastward along a line dipping but  $5^{\circ}$  to  $10^{\circ}$  below the western horizon this change in its direction could be accounted for by supposing the effect of the pressure to cause these soft measures lying between the more rigid jaws on which pressure and resistance were exerted, to assume a curved line between them as is

the case when one presses together the edges of a pack of cards. Of course the same application would apply if the cause of the pressure were to be sought in the gradual or sudden giving way of the strata below the Mesozoic deposits, while the Eozoic rocks on the margins stood firm. Gravity in drawing the whole basin into a necessarily more limited area would produce the same effect upon them as if the Pigeon Hills and Codorus Range on the one side and the South Mountain on the other gradually approached each other; except so far as the first hypothesis would render probable a different kind of fracture on the margins from that which would result from the latter and from that which is observed.

That is to say, that by the settling down of the middle of the New Red Sandstone area, its edges would be pulled down after the sinking rocks and there would result chasms and rifts where the rocks thinned out. On the contrary, in case the two jaws of such a vice approached each other, the margins would be crushed against and over the adjacent portions of the formation and while there would be no breaks, it would result that the rocks would be very much crushed. In either case, in all probability, clay deposits would be frequent.

It may well be, that the determination of trap in large mass to the edges of the New Red, and the isolation of patches of sedimentary strata as at Morganthaler's, etc., were the consequences of the production of the rifts here alluded to, through which molten rock would naturally find its way.

But it ought to be borne in mind that in the great erosion which has taken place since these events, the detached and crumbled portions must, for the greater part, have been carried away.

There is little danger of having mistaken a plane of bedding for one of cleavage in the observed dip of S. E.  $67^{\circ}$  to  $85^{\circ}$ , between Wellsville and Dover, for the former, (as is sufficiently seen by the part already described,) is N.  $5^{\circ}$  W. to N.  $10^{\circ}$  W., seldom N.  $40^{\circ}$  W., with corresponding reverse dips at the commencement of the line S.  $5^{\circ}$ — $10^{\circ}$  E., whereas the law governing this plane (be it caused in whatsoever manner it may) is E., to S.  $40^{\circ}$  E., and at a uniform rate of change which makes

a direct proportion between the southing in the direction of its dip and the distance S.  $47^{\circ} 30'$  E. over the line of section.

Leaving out of account these alternate exposures of trap and of sediments as not giving definite enough information of the position of the strata to depend upon, we may follow our line of section  $8\frac{1}{2}$  miles over the upturned edges of the New Red Sandstone, dipping with apparent regularity from N.  $37^{\circ}$  W. to W.  $35^{\circ}$  N., and with a steepness of from  $20^{\circ}$  to  $38^{\circ}$ . There are no dykes of trap along lines of fracture which may be supposed to have thrown up the measures and repeated them along this line. Allowing for the flexions in the strata, there is a thickness of from 16,000 to 19,000 feet of the New Red Sandstone in this portion of York county. Mr. Heinrichs, of the Midlothian collieries in Virginia, in several borings which he made, found the thickness of the measures to be between 1,500 and 1,600 feet. But pending the direct investigation of this point by exploitation drill holes, sunk under the auspices of the survey, the thickness of the New Red Sandstone in this portion of our State might be taken provisionally at somewhere near 16,000 feet.

So far as the measurement is based upon the observations contained in this section line they are rendered of doubtful authority if unsupported by other facts; for, owing to the large area covered with intrusive traps the estimation was stopped at (*k*), or the last trap met with between Wellsville and Beeler's cross-roads, as nothing could be definitely predicated in regard to the relation of the beds on the opposite side of such trap intrusions. But within this area many favorable spots can be selected for sinking a bore hole to prove the thickness of this formation, because the region is quite free from indications of trap dykes.

The occurrence at (*i*) of greenish gray sandstone—a color suggestively like the chloritic schists which formed much of the bottom of the early Mesozoic sea, and with which our line commenced, makes the hypothesis a plausible one that this portion of the section represents rocks near the bottom of the series.

Attention was paid to the order in which the variegated sandstones or slabs followed each other, but as yet no structure

has been made out of such notes. This whole subject will be discussed again when the data from actual observations on the thickness are at hand.

The last dip occurs near Beeler's cross-roads, which is near the starting point in Section 2a in Report of Progress for 1874. Here the coarse limestone conglomerate dips N.  $60^{\circ}$  W.— $80^{\circ}$ . It appears by the work already done on that section (which commences 1,000 feet or more north-west of the cross-roads) that this steep dip of the conglomerate is very local, and merges gradually into a gentle dip in the same direction, instead of changing suddenly, as it would do in an overthrown anticlinal; and this turning up of the edge could easily be explained by the settling of the floor on which this Mesozoic estuary deposit rested. Its marginal portions would tilt upwards in a sort of conglomerate floe, like the upturned sheets of ice on the banks of a frozen river on the recession of the tide.

*Sub-Section, No. 6a.*

The line of this section lies wholly within the New Red Sandstone formation. It starts from two miles S.  $25^{\circ}$  W. from Franklintown (a) and runs S.  $40^{\circ}$  E. to a point  $4\frac{1}{4}$  miles S.  $15^{\circ}$  W. of the town of Wellsville.

It was constructed from the data collected on that part of the transit line which was employed in locating the ore banks of J. Lichte and Jacob Smith, in Washington township, York county, and the length of the section is about  $6\frac{1}{2}$  miles. Owing to the circumstance of its lying entirely within the Mesozoic strata, it offers no means of estimating the entire thickness of these strata.

The first dips are in red shale, with variable amounts of sand, but very generally arenaceous.

The following table will give the dip and cleavage as accurately as this could be ascertained, together with the material in which the dip was observed and the number which distinguishes it in the collection to be forwarded to Harrisburg:

Observations.	Cleavage.	Dip.	Character of Rock.	Distance in feet from starting pt. of section.	Provisional field No. of specimen in collection.
		N. 20° W.—15° N. 15° W.—20° W. 40° N.—17° W. 40° N.—27° N. 35° W.—34° N. 45° W.—28° N. 45° W.—34° N. 40° W.—34° N. 25° W.—22° N. 40° W.—32° N. 45° W.—40° N. 45° W.—34° S. 40° E.—44°	Red shale..... Red shale..... Red sandstone..... Red sandstone..... Red sandstone..... Red shale..... Red shale..... Red shale..... Red sandstone..... Red sandstone..... Red sandstone..... Red shale (very sandy)..... Red shale..... Red shale.....	0 600 2,180 2,450 2,900 4,400 5,100 6,300 6,450 6,600 7,100 7,440 7,920	
Note book, X.VIII, 6					
At this point (b) there occurs an apparent anticline, which is of small importance, however, even if the dip be reliable; for in the next few hundred feet the measures resume the normal direction of N. 30° W.—20°.		N. 30° W.—42° N. 25° W.—30° N. 25° W.—46° N. 30° W.—48° N. 30° W.—42° N. 27° W.—36° N. 27° W.—48°	Red sandstone..... Red shale..... Red shale..... Red shale at bridge over Bermudian..... Red shale..... Red shale..... Red shale.....	8,480 10,400 12,160 17,010 18,700 19,330 21,400	527,567 570 774 777 777
Bridge over Bermudian creek..... W. 25° N.—36°					21,940 22,270 22,560
Between this and the next dip is, almost certainly, (at c.) a collapsed anticlinal axis, or a crumpling of the strata, due to the adjoining trap dyke, involving at least 1,000 feet of strata.		E. 20° S.—64° N. 20° W.—32° E. 20° S.—36° N. 45° W.—48°	Purplish Blue sandstone..... Coarse green sandstone..... Blue mud rock, very hard Argillite. Bermudian Creek..... Between the last two dips there must lie the axis of a small synclinal.		505,526,577,588 22,800 776
E.—70° .....					

1977-1978

1978-1979

1979-1980

1980-1981

1981-1982

1982-1983

1983-1984

1984-1985

1985-1986

1986-1987

1987-1988

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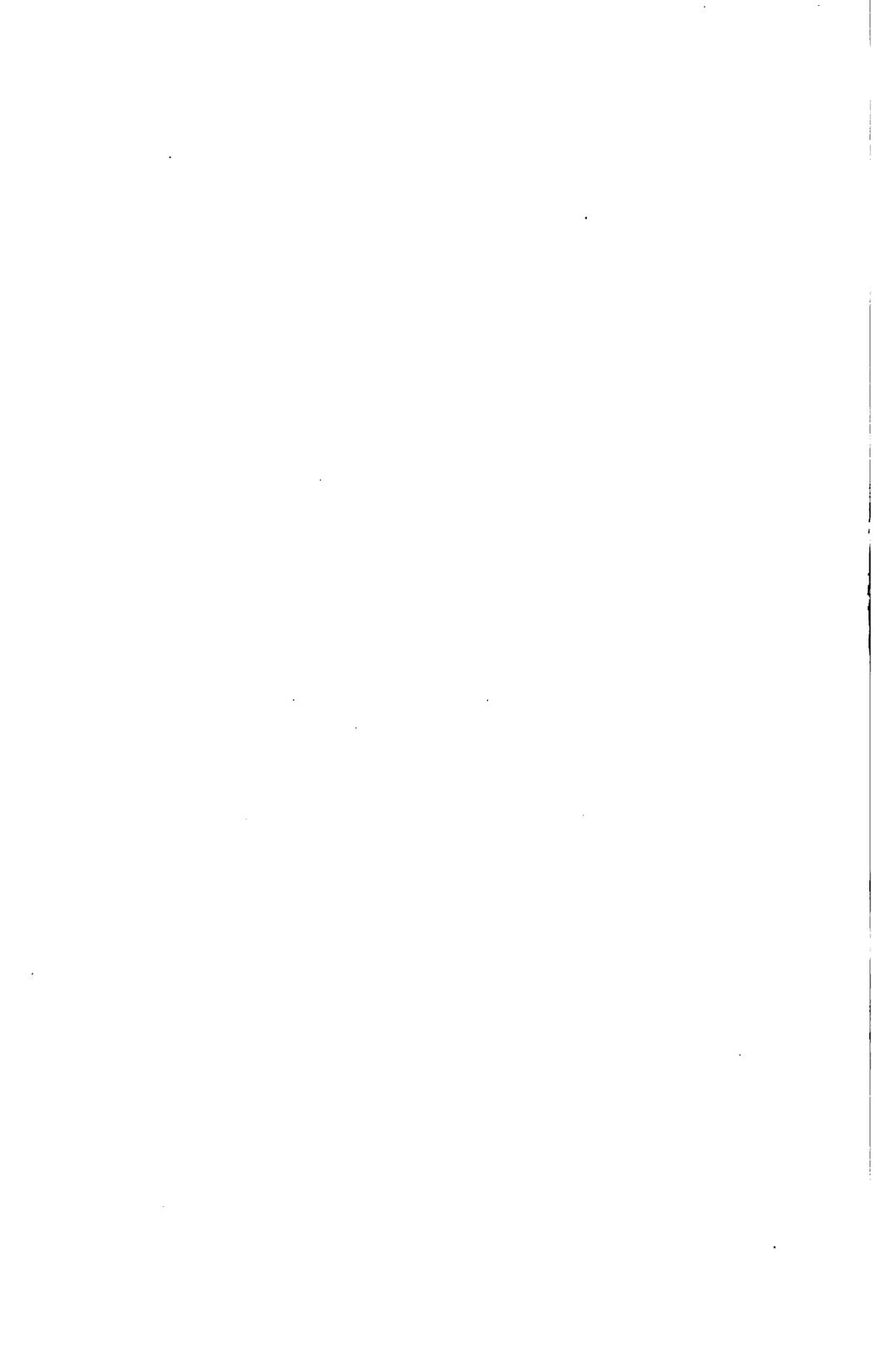
2008-2009

2009-2010

2010-2011

2011-2012

2012-2013



Observations.	Cleavage.	Dip.	Character of Rock.	Provisional field number of specimen in collection.
			Coarse dolerite..... Coarse dolerite..... Coarse dolerite..... Probably this trap replaces the sedimentary rocks for nearly three-fourths of a mile, as indicated above. Argillites..... Altered sandstone, with Lighty's ore .....	22,990 23,680 26,250 26,500 27,040 769,789,540 760,547,759,767, 830,831,883,789, 789,540.
Vert. strike N.	N. 30°W.—40°			
	N. 20°W.—50°			
	N. 40°W.—40°		Jacob Smith's ore .....	27,340
	N. 40°W.—30°		Purplish argillite..... Red shaly sandstone .....	507,516,525,530, 546,551,765,766, 768,814,822,824, 825,826,827,828, 829.
	N. 40°W.—38°		Argillaceous red shale.....	28,160
	N. 15°W.—38°		Red shale .....	28,450
	N. 33°W.—38°		End of line .....	32,850 33,760

*Section No. 7.*

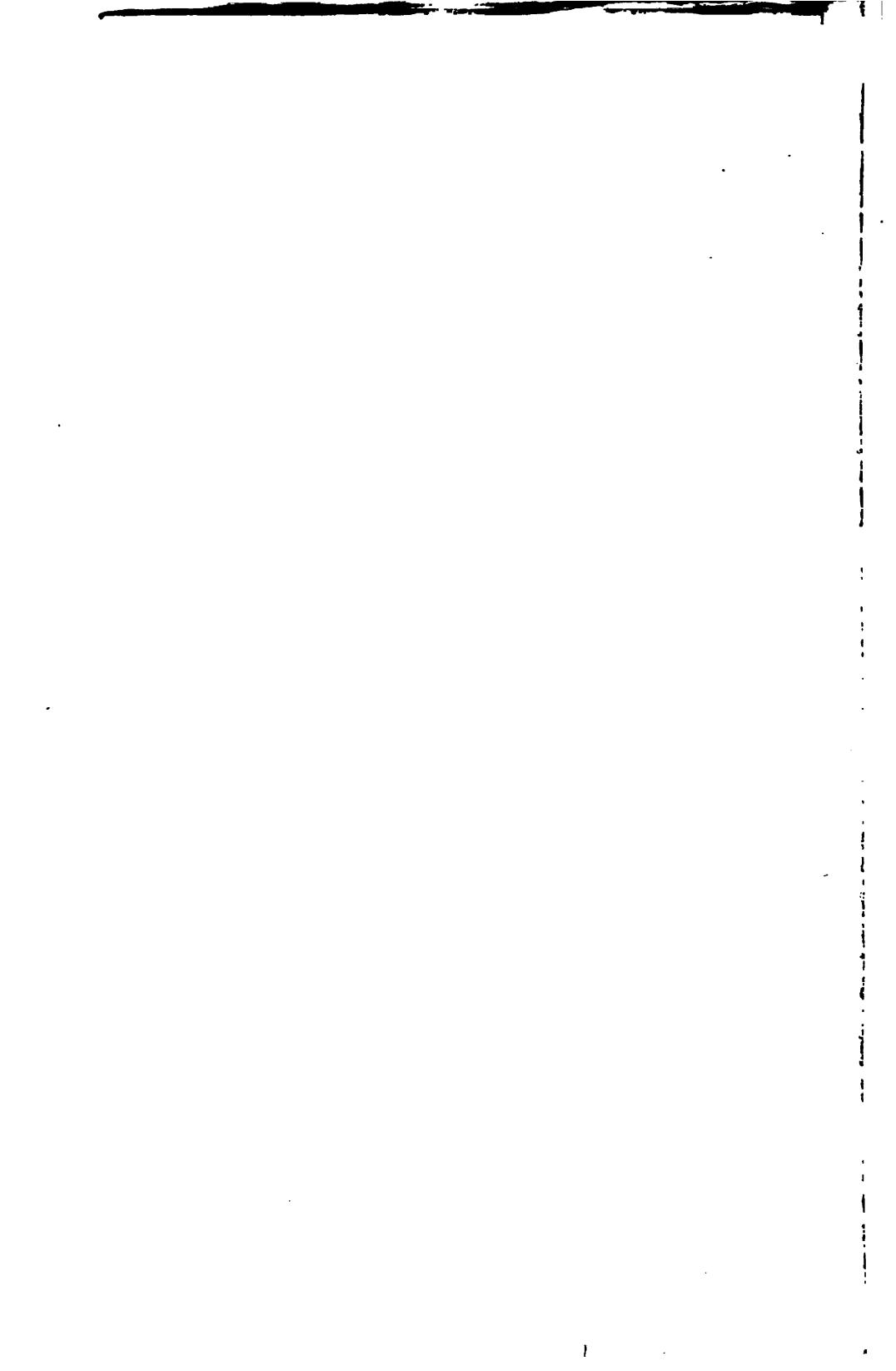
This section starts from a point  $1\frac{3}{4}$  miles E.  $40^{\circ}$  N. of Mount Holly, and runs S.  $27^{\circ}$  E. to a point  $2\frac{3}{4}$  miles S. W. of Mechanicsville, Adams county.

A complete construction of the curves of the strata between the terminal points of the line cannot be accomplished with the data above given, because there is a long distance from the Yellow Breeches creek, where the Auroral rocks were found in place, to Mount Holly ore banks, where the slates and quartzite were first observed in place. This is a distance of nearly two miles. Omitting this then from the account we come upon a wave in the strata 2,300 feet south-east of Papertown, the sandy quartzite showing a narrow synclinal of a few hundred feet followed by an anticlinal of about 1,000 feet. Following over 17,000 feet (perpendicular thickness) of quartzite and sandy slates there is met another north-west dip in the weathered slates in the south-east end of the Thomas Co.'s Mt. Holly Ore bank, which affects the structure to an uncertain extent, but probably indicates a shallow and short synclinal trough.

Succeeding this at a distance is a south-east dip in quartzite, and then another absence of exposures for about  $1\frac{1}{4}$  mile to an outcrop of shaly orthofelsite porphyry. How the intervening rocks connect these two points is not clear.

Another hiatus of  $2\frac{1}{4}$  miles occurs here, where no details of rock position were discovered, but in the succeeding  $2\frac{1}{4}$  miles there seems to be sufficient evidence for believing the remains of an overturned anticlinal to fill up this latter space. This is begun by a dip of E.  $30^{\circ}$  S.— $55^{\circ}$ , and another 1,800 feet S. E. on our line gives E.  $40^{\circ}$  S.— $65^{\circ}$ , both in chlorite slates, which represent the steep or overturned side of the anticlinal, whereas the same material dipping E.  $30^{\circ}$  S.— $25^{\circ}$ , and S.  $30^{\circ}$  E.— $30^{\circ}$  is found occupying a broad area of 1,600 feet or more, at a distance of 3,000 feet further on the line, and is in all probability the gently and normally dipping limb of this anticlinal. This indicates a total thickness of these slates of about 2,000 feet. Beyond this the structure is made again obscure, owing to numerous intrusions of igneous rocks. As a result of this action,

12.2.1.3.000  
12.2.1.3.001  
12.2.1.3.002



after a mile from the last exposure, which is filled up with traps, a dip occurs just north-west of Lear's limestone quarry, of E.  $20^{\circ}$  N.— $50^{\circ}$  (?) probably cleavage.

The limestone itself dips S.  $35^{\circ}$  E.— $25^{\circ}$ , and is followed by the New Red Sandstone, which in an exposure, 3,000 feet further on dips N.  $25^{\circ}$  W.— $30^{\circ}$ , a general direction of dip maintained to the end of the section.

The principal information which this section affords us is that there are a few shallow flexures in the South mountain rocks near Papertown, in Cumberland county, and a long inverted anticlinal in Adams county, near their contact with the overlying New Red.

The structure here assigned to the South mountain is in the main the same as that published in Rogers' report as part of Section VII of the last Survey, but Mr. Rogers does not mention the occurrence of limestone, which is an important element of the problem, be it of what age it may. I am obliged to confess, too, that in spite of considerable trouble I was unable to get the data necessary for making this section continuous.

The following table sums up the information to be derived from a study of section 7:

Observations.	Cleavage.	Dip.	Character of Rock.	Distance in feet from starting p't. of section.	Provisional field number of specimens in collection.
The first recorded dip is in the Cumberland valley, on the west bank of the Yellow Breches nearly South of Carlisle. This dip is— Yellow Breches Creek. There is here an interval of nearly two miles destitute of exposures. Harrisburg and Potowmack railroad and Papertown.....	S. 45° E.—45° S. 40° E.—60° S. 40° W.—60° S. 40° E.—85°	E. 10° S.—48° (?) E. 35° E.—25° S. 40° E.—30° S. 40° E.—30° S. 35° E.—38°	Sandy Argillite..... Sandstone quarry..... Quartzite..... Quartzite Rose Color..... Mountain Creek Quartzite..... Compact greenish slate..... Flaggy Sandstone..... Brown Sandstone..... Sandy Shale..... Ore banks Thos. Jr. Co., and Medler, Saylor & Co..... Quartzite..... For above one mile from this point no exposure is recorded.	0 4,900 7,750 ~ 11,000 12,200 12,800 14,100 14,600 20,100 20,350 20,700 21,600 28,750	967 720 857 856 854 855 833 832 847 846 845 844 843 842 841 83,150
Strike E. 30° N.—vert. Mountain Creek.....	S. 40° E.—60°				
E. 20° N.—72°	S. 40° E.—30° S. 40° E.—30° Ore banks Thos. Jr. Co., and Medler, Saylor & Co.				
Small Run, Monosmith's (?) .....	E. 35° S.—25° E. 35° S.—45°	S. E. (?) .....	Shaly orthofelsite..... Shaly orthofelsite..... Chlorite Shale..... Orthofelsite..... Arenaceous schist..... *Mountain Creek Rock..... Trap (boulders?)..... Orthofelsite in place..... Chlorite schists, with veins of quartz..... Chlorite slate..... Chlorite slate.....		
Between 20,700 & 31,400 there occur in succession (the localities not accurately noted)					
Run.....					

Observations.	Cleavage.	Dip.	Character of Rock.	Distance in feet from starting pt. of section.	Provisional field number of specimens in collection.
		E. 40° S.-66° E. 30° S.-25°	Chlorite slate... Orthofelsite... Chlorite slates...	33, 350 45, 300 36, 300	859 835
		S. 30° E.-30°	Chlorite slates... { Whitish calcareous slate. Greenish epidotic rock...	87, 100 37, 950	861 862 & ore 863
			{	39, 000	{ 887 886
Trap Ridge.....				39, 600	
Lerew's.....				41, 800 42, 600	787 786
Stambaugh's Mill.		S. 35° E.-25°	Trap (?)..... Argillite..... Bog ore..... Bog ore...	46, 800 43, 200	884 (835 (?)
Lear's quarry.....	E. 20° N.-50°	N. 25° W.-30°	Limestone Red shale...	43, 500	874
		N. 40° W.-30°	Red shale and conglomerate.....	46, 450	785
		N. 35° W.-49°	Red shale..... Red sandy shale and argillaceous sandstone...	47, 800 49, 700	785 786
State Road.....		N. 25° W.-40°	Red shale and argillaceous sandstone.....	52, 000	
		N. 25° W.-40°	Red shale and argillaceous sandstone.....	57, 700	785
		N. 30° W.-40°	Purplish shale.....	68, 600	
			Green shale, the latter usually of amethyst color.	59, 850	782
		N. 35° W.-40°	Purple shale...	60, 250	
		N. 30° W.-40°	Green shale.....	61, 500	
		N. 30° W.-40°	Red shale.....	62, 400	
		N. 30° W.-38°	Red shale.....	62, 800	

\*A nacreous schist studded with quartz pebbles, the latter usually of amethyst color.

*Description of a route over the South Mountain from Petersburg to Boiling Springs, covering part of the ground which was studied for the construction of Section 7.*

Passing west on the turnpike to Carlisle, a turn to the right on the outskirts of Petersburg and close by a blacksmith's shop leads the traveller over a hill composed of Mesozoic sandstone and mud rock and shale, interspersed here and there with blocks of trap (dolerite.) This continues to Lerew's store, where the route chosen causes one to turn to the left. In the vicinity of this store are confused masses of schists, shales and quartz, which line the way as far as Fickle's.

A short distance beyond here, and on the edge of a grove, were observed large floating boulders of a sandy schist, much decomposed, but still hard.

Just beyond this appear large blocks of "*jaspery quartzite*"—or orthofelsite, and still further (say  $\frac{1}{4}$  mile from Fickle's) large slabs of this rock, possibly in place, and dipping south-west, but nearly horizontal.

The compact schists are most abundant, but occasionally there appears sandy greenish rock, laminated in layers of about  $\frac{1}{8}$  inch in thickness, and intersected by veins of quartzite. At about 180 yards from the intersection of this road with the Carlisle turnpike compact schists dip S.  $40^{\circ}$  W.— $14^{\circ}$ .

The rock observed for several hundred yards along the pike was brown on the external surface, but on being broken showed itself to be a sandy white, very much weathered, crystalline schist, with which was interbedded a considerable thickness of orthofelsite. Much of the same white sandy weathered rock occurs beyond (north-west.)

These schists continued, wherever seen, to show numerous intersections by quartz veins, and to be interstratified with quartzite up to within three miles of Boiling Springs on the road which extends northward from the Carlisle turnpike in this direction.

One of their outcrops observed shortly before their replacement by sandstone gave W.  $10^{\circ}$  S.— $20^{\circ}$ , while the following dip in sandstone was N.  $30^{\circ}$  E.— $20^{\circ}$ .

This would seem to show not merely a non-conformability between the older (Huronian?) orthofelsites and schists and the more recent (Cambrian?) sandstone, but it would seem additionally to imply that the alignment of the one system was the result of causes entirely different from and anterior to those that formed the other. It is not forgotten in this connection that the dip of N.  $10^{\circ}$  E., recorded for the newer of these rocks, is abnormal, and if not due to the suppression of the true plane of bedding by the cleavage, is the result of one of those local disturbances, of which the traces are so abundant along the flanks of this mountain. This dip was obtained in many places along a ledge of rocks, where it was very improbable that the bedding could have been successfully counterfeited, and the force, whatever it may have been, which produced this inclination, seems to have had effect on the sandstone, to the exclusion of the schists.

Large numbers of boulders of dolerite are observed not far from the toll-gate, lining the New Oxford road southward from its junction with the Carlisle turnpike, filling the gutters in places, and covering the surfaces of the fields.

This locality is outside of any vestige of the New Red Sandstone, and is nearly between two parts of the long broken line of trap; one of which, on the last State geological map, is seen to pass northward from the Maryland line near Cashtown, Arendtsville and Whitestown, where it is lost in the border of the South Mountain system; and another to begin not far from Boiling Springs, and to continue to cut all the measures, till its trace is finally lost far north of the Susquehanna. No trace of trap has been noticed from here northward to a point in the Cumberland Valley. The locality where these boulders of trap were observed was entirely within the limits of the South Mountain system, and almost directly between the south end of this long dyke and the north extremity of the thread of trap first noticed. If this should prove to be in reality a continuation of this dyke through the area of the pre-Silurian rocks, it would be a phenomena of great interest. The circumstances are very unfavorable for observing any effect on the topography of such a dyke, for the mountains are very much eroded, and for the most part covered deep under their own de-

bris; nor is the power of the dolerite to resist this erosion so different from the surrounding rock (as is the case in the soft Mesozoic measures) as to give rise to any higher ridges than they.

Except by some favorable accident, then, the only manner of proving the existence of such a dyke would be by such fragments and boulders as are here seen.

#### *Section No. 8.*

This extends from a point on the Yellow Breeches creek,  $1\frac{1}{4}$  miles N.  $20^{\circ}$  W. of Milltown, Cumberland county, to a point  $\frac{5}{8}$  of a mile north-east of Bendersville, Adams county, a distance of  $9\frac{1}{2}$  miles.

The first exposures noted are in the limestone quarry about  $\frac{1}{2}$  mile north-west of the Yellow Breeches Creek, and forming a low bluff parallel to the stream.

A dip of E.  $40^{\circ}$  S.— $50^{\circ}$  was followed by another exposure in the same rock, and at a distance of 150 feet, of N.  $20^{\circ}$  W.— $25^{\circ}$ . One of these planes may be cleavage, and as the next following  $2\frac{1}{2}$  miles of section are over a flat bottom land, covered perhaps several hundred feet deep with the debris of the mountain rocks, there is no means of determining this point.

The bed of the Yellow Breeches creek occurs at a distance of 1,500 feet from the starting point. There is a gradual rise of the country from there to 14,300 feet from the initial point, where an exposure of quartzite proves to dip S.— $40^{\circ}$ .

The section can be most succinctly described in the following table:

Observations.	Cleavage.	Dip.	Character of Rock.	Distance in feet from starting p't of section.	Provisional field number of specimens in collection.
		E. $40^{\circ}$ S.— $50^{\circ}$ N. $20^{\circ}$ W.— $25^{\circ}$	Limestone..... Yellow Breeches Creek..... Gap of nearly $2\frac{1}{2}$ miles.	0 150 1,500	986 985
	S.— $40^{\circ}$	S. $20^{\circ}$ W.— $75^{\circ}$	Quartzite.....	14,300	
	S. $45^{\circ}$ E.— $30^{\circ}$	S. $45^{\circ}$ E.— $35^{\circ}$	Quartzite.....	15,400	984
	S. $30^{\circ}$ E.— $25^{\circ}$	S. $30^{\circ}$ E.— $35^{\circ}$	Fragments of schist..... Schist conglomerate..... Chlorite schist conglomerate..... Chlorite schist conglomerate..... Conglomerate schist..... Conglomerate schist..... Crystalline schist..... Quartzose crystalline schist, with conglom. sch.	16,700	
	S. $30^{\circ}$ E.— $35^{\circ}$	E. $40^{\circ}$ S.— $30^{\circ}$	Quartzose conglomerate schist..... Quartz conglomerate schist..... For the next 1,900 feet, no exposures were seen.	17,800 18,200 18,350 18,900 19,150 19,300 19,500 19,700	983
	S. $25^{\circ}$ E.— $45^{\circ}$	E. $40^{\circ}$ S.— $40^{\circ}$	Quartz conglomerate schist..... Fragments of schist and milky quartz..... At the next observation the slates assume more the character of talo slates, and seem to belong to the steeper (N. W.) side of an anticlinal of unknown dimensions.	21,600 22,100	979, 978 977
	S. $30^{\circ}$ E.— $80^{\circ}$	S. $30^{\circ}$ E.— $80^{\circ}$	Schists tinted red and blue..... Soil sandy, no fragments.	22,500	975
	E. $40^{\circ}$ S.— $45^{\circ}$	E. $40^{\circ}$ S.— $45^{\circ}$	Schist.....	22,600	
	W. $20^{\circ}$ N.— $25^{\circ}$		Fragments of orthofelsite, milky quartz and talcose slate.....	23,200	
	E. $40^{\circ}$ S.— $40^{\circ}$		Hydro-mica schist.....	24,100 24,200	973 972

Observations.	Cleavage.	Dip.	Character of Rock.	Provisional field num- ber of speci- men in col- lection.
				Distance in feet from starting pt. of sec- tion.
S. 15° E.—35°			Crystalline schist.... Pine Grove Furnace..... Fragments of quartzose chlorite schists. Mountain creek and South Mountain railroad.... Small ore bank up mountain side..... Thomas Iron Co.'s ore bank..... Limestone quarry..... (A dolyses of this limestone will be found elsewhere.) Quartz fragments. Sandy quartz fragments..... The schist passes gradually between 30,000 feet and 32,000,) into fragments of pulverulent quartzite.	25, 400 25, 800 26, 850 27, 450 27, 800 28, 200 966 to 969 incl.
N. W. (?)			Quartz, concholomerate schist..... Green schist, with quartz pebbles..... Hydro-mica schist..... Hydro-mica schist, with pebbles..... Hydro-mica schist, with pebbles..... Hydro-mica schist, with pebbles..... Hydro-mica schist, with pebbles..... The last six outcrops included within a bracket are all schists of various hues and consistency, containing amethystine to transparent quartz pebbles.	32,000
S. 30° E.—40°			Fragments of quartz conglomerate..... Fragments of orthofelsite gradually becoming more frequent..... Orthofelsite, with admixture of schists..... Fragments of milk quartz, orthofelsite and above Hydro-mica schist.....	962 964 966 967 988 989
S. 20° E.—40°				34, 600
S. 30° E.—40°				35, 200
S. 45° E.—45°				37, 200
S. 30° E.—45°				37, 900
E. 40° S.—70°				37, 900

Observations.	Cleavage.	Dip.	Character of Rock.	Distance in feet from starting pt. of section.	Provisional field number of specimen in collection.
			<p>Junction of orthofelsite and schist.            Fragments of orthofelsite and milky-quartz, and            some of diabase (?)</p> <p>Orthofelsite.....</p> <p>Mixture of chlorite, schist and orthofelsite .....</p> <p>Orthofelsite-porphyry.....</p> <p>Fragments of orthofelsite, schists, and milky            quartz, .....</p> <p>Schist and orthofelsite.....</p> <p>Fragments of orthofelsite, chlorite schists, and {            occasionally diabase (?)}</p> <p>Green crypt. cryst. schists .....</p> <p>Fragments of orthofelsite and milky-quartz.....</p> <p>Cryptocrystalline schist and slaty orthofelsite.....</p> <p>Blue slaty orthofelsite.....</p> <p>Blue milky-quartz.....</p> <p>Along with the rocks mentioned in the last            two notes are also occasionally diabase (?) and            milky-quartz.</p>	38,200 39,100 39,200 39,500 40,000 40,800 42,000 43,600 44,400 44,600 49,600 50,100	959 953 990

This section presents a few noticeable features which serve to corroborate the structure of the South Mountain, as interpreted from other sections. There is the usual absence of exposures between the first distinctly marked outcrop of limestone and the first dip in the South Mountain rocks.

Omitting the  $2\frac{1}{2}$  miles which intervene between these two outcrops in this section, we have first an overturned synclinal of about 1,100 feet between the exterior limits of the limbs on the present surface. Between the axis of this and the next synclinal there intervene about 4,800 feet, chiefly filled with the successive overlying strata of the south-east limb of an anticlinal.

To what extent the shortly following dip of S.  $30^{\circ}$  E.— $80^{\circ}$  may affect the measures is not certain, but it is clear that this dip occurs very near the axis of the anticlinal to which it belongs, for a few hundred feet further on occurs a dip of E.  $40^{\circ}$  S.— $45^{\circ}$ .

This is closely succeeded by a very gentle north-west dip, viz: N.  $20^{\circ}$  W.— $25^{\circ}$ , which is again joined to one of E.  $40^{\circ}$  S.— $40^{\circ}$ .

Between the steep dip of S.  $30^{\circ}$  E.— $80^{\circ}$  and E.  $40^{\circ}$  S.— $40^{\circ}$ , there intervene about 1,600 feet, and the synclinal which this space includes is doubtless part of a collapsed anticlinal fold. Two-thirds of a mile further along the line is another gentle north-west dip, which, however, owing to the decomposition to which all these rocks have been subjected, is somewhat doubtful, and if it exist will only subtract a small amount from the thickness of the measures.

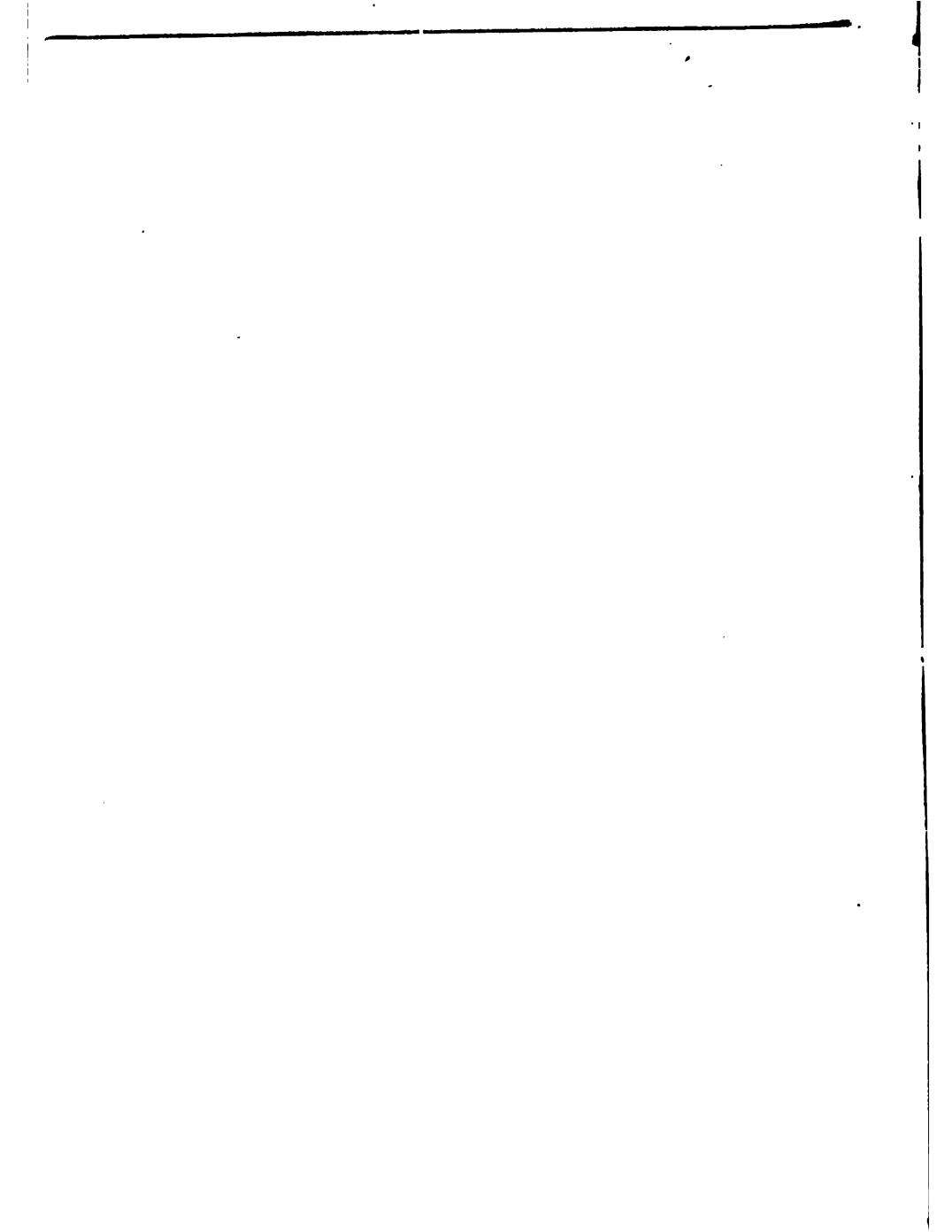
But a short distance from this north-west dip occurs the Aurora limestone of the Thomas Iron Co.'s quarries, near Pine Grove, with a dip of S.  $30^{\circ}$  E.— $40^{\circ}$ . There are no notes of this line which settle the question of the conformability or non-conformability of this limestone, and as the proximate portions of the line contain no exposures, and only loose fragments of quartzite, it is left as a single outcrop to divide the series of the north-west from those of the south-east.

The varieties of rock which have been met with heretofore are all more or less related to the quartz conglomerate schist, or quartzose schist, which has been elsewhere referred to as "Mountain Creek Rock."

1. 8000

4. 1000

2. 1000 3. 1000 5. 1000 6. 1000



At this point a gradual change begins as induced from the loose boulders and fragments, whereby orthofelsite and its many modifications, takes the place of this conglomerate and persists to the end of the line.

The quartzose schists north-west of this line dividing the two series appear to underlie the before-mentioned orthofelsite group to the south-east of it, which first appears in a steep and short synclinal and anticlinal, each having a spread of about 800 feet and the latter being followed by a broad and gently sweeping synclinal which covers the last two miles of this section.

Hence, it is made apparent that the great South Mountain chain is composed essentially of two groups of rocks, the lower (and along this line the north-western) consisting of various modifications of the quartz conglomerate above spoken of, and in which quartzite occurs under various forms. The upper, and south-easterly group is felsitic in character, but contains also large beds of hydro-mica and chlorite schists, intersected by veins of milk quartz; while the orthofelsite itself presents every variety of appearance, from a sandy and earthy slate, in which the crystals of orthoclase are very much decomposed, indeed are sometimes almost clay, through the jasper-like variety to the massive and coarsely porphyritic structure in which it is suited to be used as an ornamental building stone.

This section ends about  $1\frac{1}{2}$  miles north-west of the edge of the Mesozoic sandstone, which cuts the Bendersville-Gettysburg road about 1 mile south of the former town.

NOTE.—The districts which furnished the data for sections Nos. 9, 10 and 11 of this report were more thoroughly investigated during the summer of 1876. The sections here given under those heads will be regarded as provisional simply, and subject to modification from the work of the present year.

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#### Section 9.

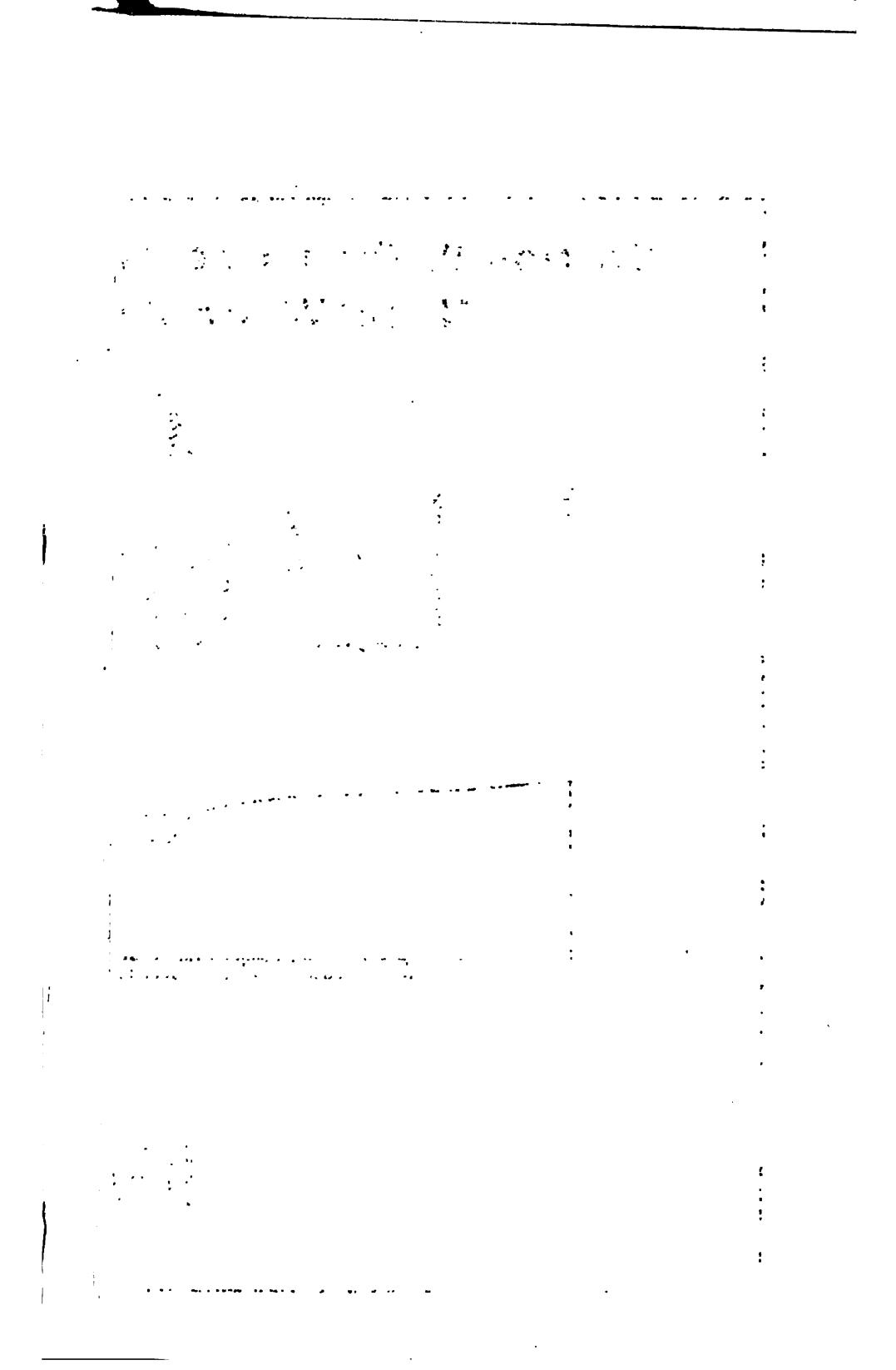
The line starts from a point on the Gettysburg and Shippensburg road, at the summit of the South mountain, eight miles N.  $48^{\circ}$  W. of Arendtsville, and runs S.  $42^{\circ} 30'$  E. to a point three miles W.  $35^{\circ}$  N. of Arendtsville.

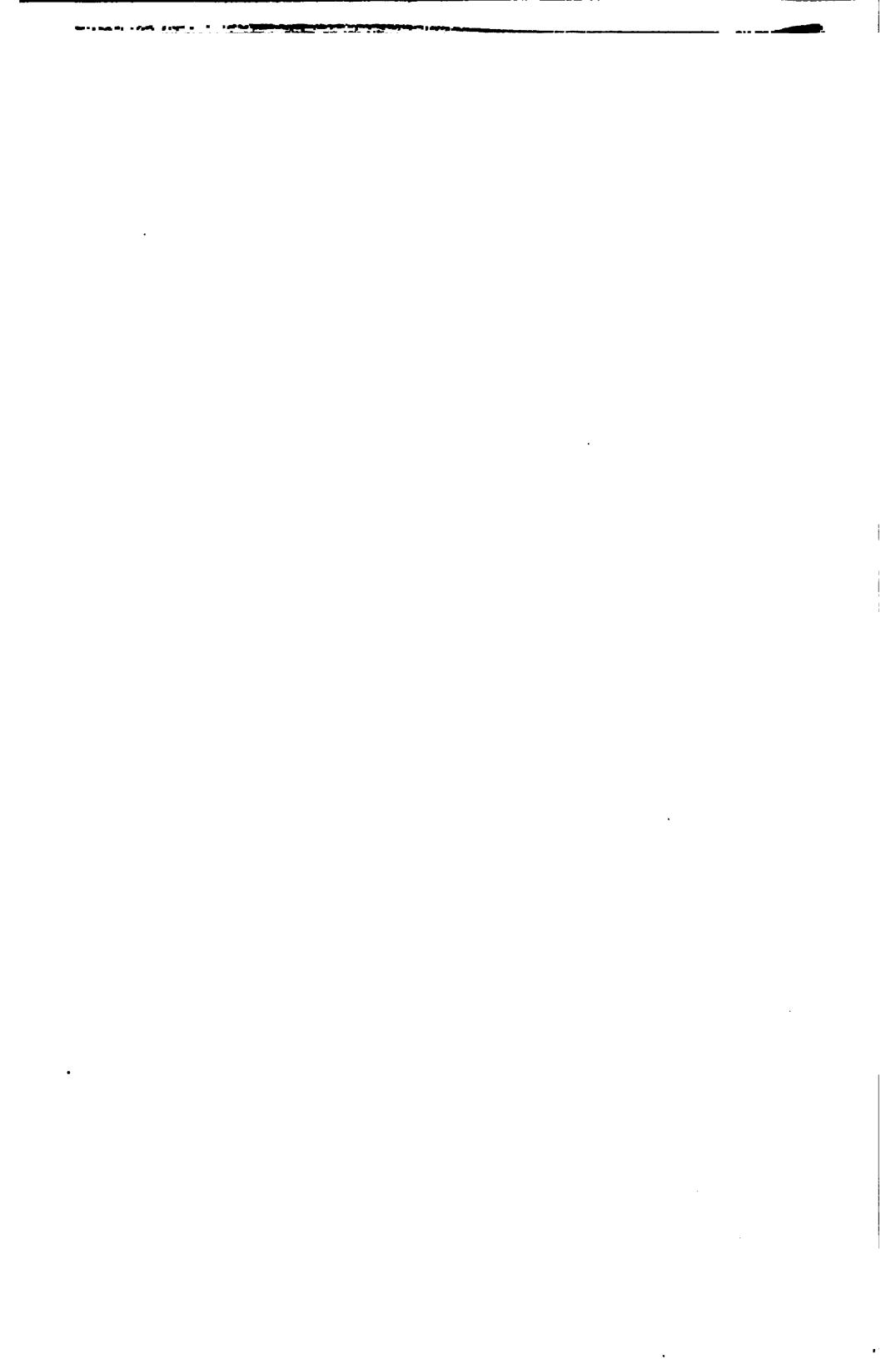
286 C. P. FRAZER, JR., REPORT OF PROGRESS, 1875.

The surface of the mountain in this the first 4,600 feet of the section is sandy and destitute of exposures, though there are found many fragments of quartzite strewn over the surface. At this point an outcrop of quartzose schist exhibits a dip of S. 45° E.—60°.

Observations	Cleavage.	Dip.	Character of rock.	Distance in feet from starting point of section.	Provisional field number of specimens in collection.
	S. 45° E.—60° S. 45° E.—60° N. W.—?		Quartzose schist..... Green quartzose schist amethyst colored pebbles..... Quartzose conglomerate schist..... Quartzose conglomerate schist..... Quartzose conglomerate schist..... Quartzose conglomerate schist..... Quartzose conglomerate schist..... Quartzose conglomerate schist..... From this record it would appear that the structure of this part, the beginning of the section, is modified by a great number of short waves or curves.	4,600 4,875 5,050 5,200 5,400 5,525 5,625 5,750	1,119 similar.
	N. 40° W.—40° S. 35° E.—70° N. 35° W.—55° N. 30° W.—70°		Here occurs a gap of 6,575 feet, filled up with fragments of conglomerate schist and quartzite, but not containing any exposures. In the last half mile of this distance, the schist becomes more and more thickly studded with the small quartz fragments, until it almost disappears, leaving the latter nearly in the form of a quartzite.		
	S. 35° E.—45° S. 35° E.—50° W. 30° N.—20°		Quartzose conglomerate schist..... Quartzose conglomerate schist..... This record shows a shallow synclinial also here, beyond which for 4,380 feet we see: first, fragments of the quartzose conglomerate schist with the pebbles, (and apparently too, sometimes, crystalline fragments) of amethystine color. Next fragments of a tough trap, (diabase?) which will be investigated more thoroughly by Dr. Gent and myself in the future, and of which the popular name is "copper rock." Fragments of the above and orthofelsite. Fragments of trap and milky quartz.	12,325 12,600 13,000	1,114 similar. 1,113
S. 15° E.—85°			Fragments of orthofelsite.	14,000 16,600 17,850	1,099, 1,105, 1,111 1,107, 1,108 1,105, 1,108

Observations	Clearage.	Dip.	Character of Rocks.	Dist'ce in feet from starting p't of section.	Provisional field number of specimens in collection.
		S. 40° E.—55°	Schist..... Here there is very palpably a sharp anticlinal, of which the north-west limb is likely to be over 4,000 feet thick. The dip becomes gentler in both directions from the occurrence of this fold, leading to the supposition that this point was at one time very near the true axis of the anticlinal. Orthofelsite and milky quartz..... Fragments of quartz-conglomerate-schist and of orthofelsite (most of the latter.) Pearl colored schist..... Fragments of orthofelsite, schist, and milky-quartz.	18, 100	1,103, 1,104
		S. 45° E.—25°	Conewago Creek..... Slaty orthofelsite, with fine layers of hydro-mica schist..... Conewago creek..... Porphyritic orthofelsite.....	18, 600 20, 000 20, 500	1,102 1,101
		E. 20° S.—30°		21, 750	1,100
		S. 15° E.—30°		22, 850 23, 300	1,098
		S. 40° E.—35°	End of section 4½ miles from the commencement.	23, 700 24, 200 24, 700	1,097





Again in this section the orthofelsite seems to overlie the quartzose conglomerate schist, although there is the same gap filled with the debris of igneous rock, which was noticeable in a previous section. But whether this unexplored region represents a line of displacement or not, it is still true that the rocks increase in felsitic character to the south-east, and in conglomerate schistose character to the north-west:

The data do not admit of the structure being laid down continuously with certainty.

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#### *Section 10.*

This section commences at a point  $2\frac{1}{2}$  miles N.  $7^{\circ}$  E. of Greenwood, and runs to a point  $2\frac{1}{2}$  miles E.  $40^{\circ}$  S. of Caledonia Furnace. Its length is 5.75 miles. It is in fact part of one long section from Greenwood to Littlestown which, however, owing to the non-conformability of the dip of the rocks to the line above indicated, and the absence of topographical notes on the line of mean direction of dip must needs be broken up into three parts to avoid projecting the outcrops too great a distance to the line of the section.

The South Mountain presents a persistent series of ridges from Cashtown to Greenwood, (a distance of over eight miles,) which the nearly east and west turnpike cuts at an oblique angle opposite Greenwood, the ends of the ridges quite suddenly falls off to the N. W., making a continuation of the ridges in echelon and leaving open a wide funnel-shaped gorge from the conical hill near Africa, 1 mile S. of Greenwood to the mouth of the ravine made by Phillaman's Run. The commencement of this section line being north-east of Greenwood, lies within the mountains, but not far from their north-west margin. The country is very inaccessible and wild, and presents great obstacles to topographical work.

The first dip (*a*) is in whitish gray sandstone, or a material into which the quartzite conglomerate seems to weather.

Observations.	Cleavage.	Dip.	Character of Rock.	Dist'ce in feet from starting pt. of sec-tion.	Provisional field num-ber of specimens in collection.
		S. 30° E.—60° S. 45° E.—55° S.—20°	Whitish gray sandstone..... Quartzite..... Cold Spring valley..... Grayish white sandstone..... Here occurs a wide gap of over two miles, which it is hoped will be partially filled up by next season's work.	1,214 1,217 450 0 1,050	1,214 1,217 450 0 1,050
		E. 30° S.—40°	Massive quartzite..... Here occurs the projection of the Hoosac Ore bank belonging to the Caledonia Furnace property.	13,350	
		E. 40° S.—38°	Quartz conglomerate..... Conococheague Creek.	16,900	
		S. 45° E.—42° S. 25° E.—60° S. 30° E.—52° S. 45° E.—55° S. 40° E.—39° S. 30° E.—22°	Griegenberg Springs..... White Quartzite..... Quartzite..... White Quartzite..... Quartzose Schist..... Quartzite..... Quartzite.....	15,830 19,775 19,850 19,950 20,125 20,230 20,475	15,830 19,775 19,850 19,950 20,125 20,230 20,475
			This group of exposures indicates slight variations in intensity in a comparatively uniform dip S. E. The next following dip of E. 50° S.—60°, is a little over one-third of a mile from this group (6) and seems to be on the descending limb of a synclinal roll, of which the extent must however be small since its north-west counterpart (N. W.—55°) is almost immediately followed by the south-east dips which continue to the end of the section.	1,188	
			Crossing of turnpike..... Line crosses creek..... Bluish Quartzite..... Bluish Quartzite ..	21,515 21,935 22,750 23,075	21,515 21,935 22,750 23,075
		E. 40° S.—76° E. 25° S.—80° E. 10° S.—49°			

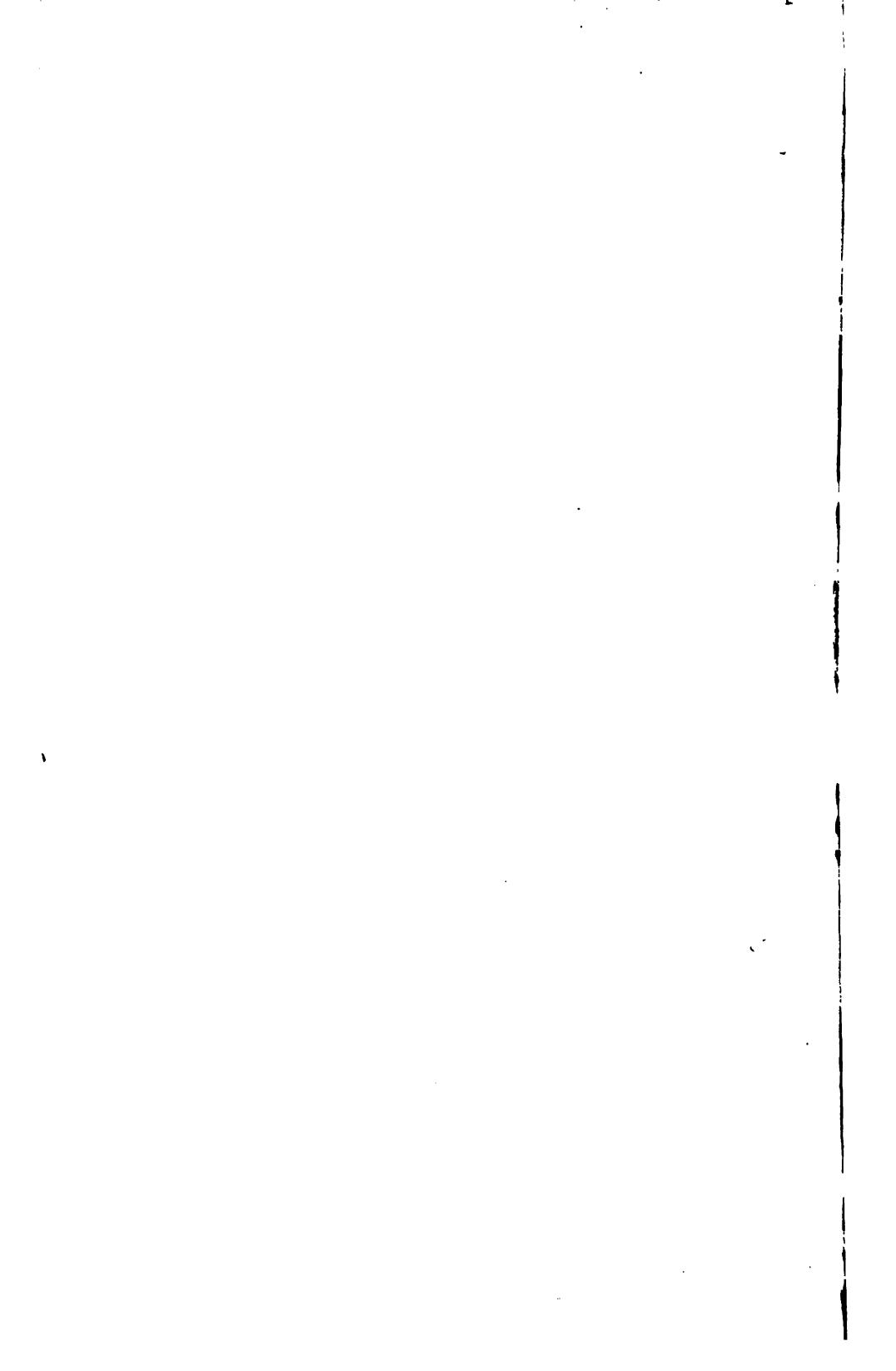
Observations.	Cleavage.	Dip.	Character of Rock.	Dist'de in Provisional feet from field num- ber of spec- imens in collection.
N. 45° W.—55°	S. 30° E.—39° S. 35° E.—37° E. 40° S.—35°	S. 10° E.—55°	Hard Bluish Orthofelsite..... Slaty Orthofelsite..... Slaty Porphyry..... Here a gap of nearly a mile intervenes which is desitute of outcrops and the end of the section, is Slaty Orthofelsite .....	25, 050 26, 300 26, 420, 1, 200 30, 700

So far as this portion of the longer section is concerned it shows a prevalence of south-east dips from its north-west to its south-east extremity. The character of the rock is either a conglomerate or quartzite for nearly five miles. At this point the quartzite becomes more blue in color and is replaced by orthofelsite porphyry. If the long gap of two miles near the commencement of the section prove to contain also quartzite with the average south-east dip, the thickness of that rock here exposed will be not less than 14,000 feet, or little less than three miles. It is yet premature to discuss the possibility of such an enormous production of quartzite.

The breadth of the mountains is here at its greatest. It is natural to seek the explanation of the sudden change in direction of dip between the north-west, or quartzite, series of the rocks of this part of the South Mountain, and the orthofelsite, or south-east series of the same range. Where the change of formation occurs (at 25,050 feet from the starting point) the dip is also changed from E.  $10^{\circ}$  S.— $40^{\circ}$  to S.  $30^{\circ}$  E.— $39^{\circ}$ .

This would be very strong evidence of non-conformability did not the previously examined structure of similar passages fail to support it, and were not the equally abrupt changes of dip in the quartzite itself numerous. It certainly seems as if the line of this alteration were one pretty distinctly marked, and divided two classes of rocks, each of which had its own characteristic strike.

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## Section 11.

Commences  $2\frac{1}{2}$  miles N.  $26^{\circ}$  E. of Caledonia Furnace, and runs S.  $38^{\circ} 30'$  E. to a point  $2\frac{1}{2}$  miles W.  $5^{\circ}$  S. of Gashtown.

Observations.		Cleavage.	Dip.	Character of Rock.	Dist'ce in Provisional feet from field num- ber of spec- imens in collection.
		S. $25^{\circ}$ E.— $39^{\circ}$ S. $40^{\circ}$ E.— $30^{\circ}$		Pink quartzite..... For about two-thirds of the distance between these outcrops the quartzite is maintained, when the schistose character commences and continues to increase until the quartzite and quartz pebbles entirely disappear. Quartzose schist..... Quartzite .....	0 4,400
		S. $40^{\circ}$ E.— $45^{\circ}$ S. $40^{\circ}$ E.— $30^{\circ}$ S. $30^{\circ}$ E.— $28^{\circ}$		Quartzite .....	6,550 6,852 1,159
		N. $35^{\circ}$ W.— $16^{\circ}$		Conococheague creek Conglomerate schist..... This marks the axis of a shallow synclinal in which the Conococheague runs at this point. The dip of the following anticlinal is nearly or exactly the slope of the hill.	7,600 8,200 9,250
		E. $20^{\circ}$ S.— $38^{\circ}$ N. $40^{\circ}$ W.— $12^{\circ}$		Schistose conglomerate..... Schistose conglomerate..... This marks another slight roll.	10,100 10,175
		S. $40^{\circ}$ E.— $44^{\circ}$ E. $10^{\circ}$ S.— $20^{\circ}$ N. $30^{\circ}$ E. $12^{\circ}$ (?)		Schistose conglomerate..... Schistose conglomerate..... Schistose conglomerate..... Conglomerate, with small fragments of quartz..... For about two-thirds of a mile from this point no exposures were apparent which permitted dip to be taken.	11,325 11,525 11,725 16,000
		S. $40^{\circ}$ E.— $40^{\circ}$		Schistose conglomerate.....	15,700 1,149

## Section 11.—Continued.

Observations	Cleavage.	Dip.	Character of Rock.	Dist'ce in feet from starting p't of section.	Provisional number of specimens in collection.
	N. 30° W.—120 W. 10° S.—200 S. 10° E.—65° S. 40° E.—55°		A little beyond this, or at 16,000, the fragments of quartzite in the schistose rock grow smaller. Micaceous slates..... Schistose conglomerate..... Green hydro-mica slates..... Laminated quartzite..... Two hundred feet from this last exposure the line crosses near Newman's, or the "Summit" on the Gettysburg-Chambersburg turnpike. From this point also the formation changes to orthofelsite. Orthofelsite..... Between this and the next outcrop, for a distance of 2,080 feet, the orthofelsite is largely intermixed with milk-quartz. Chambersburg-Gettysburg turnpike..... Orthofelsite..... For about a mile beyond this on the section orthofelsite, mixed with "copper rock" occurs. This latter is the name given by the inhabitants to a tough green crystalline rock, much of which contains epidote. Orthofelsite porphyry.....	17,525 18,100 18,700 19,200 1,187	1,186
	S. 15° E.—70°		Orthofelsite.....	20,025	1,186
	S. 30° E.—30°		Orthofelsite.....	21,500 22,150	
	S. 15° E.—30°	S. 10° E.—30°	Slaty orthofelsite porphyry.....	26,700 27,200	

We have in this section (commencing north-east of the Caledonia Furnace) first a quartzite colored pink by its fragments of amethystine quartz.

This is followed by about  $2\frac{1}{4}$  miles of a schistose conglomerate consisting of a nacreous base, with fragments (rounded or angular) of quartz. Within this distance occur three small synclinals, which appear, however to be mere shallow rolls. It is not safe to assume the thickness of these measures from the data which could be obtained, but if there be nothing unknown to contradict them the quartzite will have a perpendicular thickness of 3,200 feet and the schistose conglomerate of 6,400 feet.

Superposed upon this latter is a small synclinal trough of hydro-mica slates, the south-east limit of which descends, forming a narrow anticlinal. These measures are not more than 700 or 800 feet thick, and carry above them (S. E.) a thin layer of quartzose schist.

Close upon this the orthofelsite again comes in, and again with great variation of dip and strike, (*i. e.*, from S.  $40^{\circ}$  E.— $35^{\circ}$  in quartzose schist to S.  $15^{\circ}$  E.— $70^{\circ}$  in orthofelsite). This latter exchanges the steep dip of  $70^{\circ}$  very soon for gentle dips of  $30^{\circ}$  to  $35^{\circ}$ , increases the easting of its direction from S.  $15^{\circ}$  E., to S.  $30^{\circ}$  E., and appears to continue monocinal from the point of its commencement for a mile and a half, or to the end of this section, representing (if there be no unknown reverse dips) nearly 5,000 feet thickness of strata.

#### Section 11a.

Starts from Cashtown and proceeds S.  $58^{\circ}$  E. along the Gettysburg-Chambersburg turnpike,  $7\frac{1}{4}$  miles, to Gettysburg.

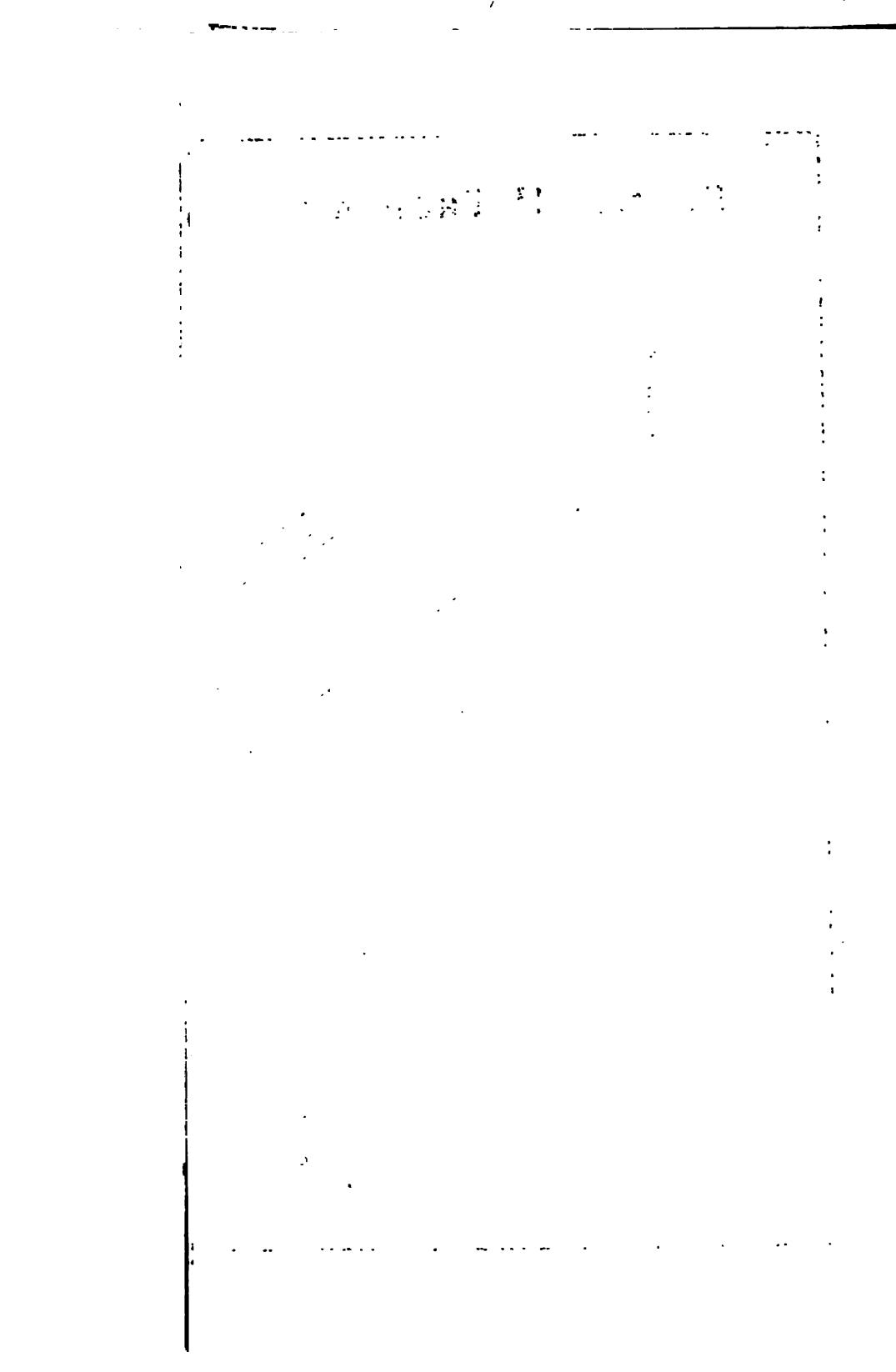
Close by the western end of Cashtown is the not very distinctly marked dividing line between the New Red Sandstone and the older rocks of the South mountain series. The latter are found in a bank as debris, but both the color of the soil and the absence of the characteristic traits of the Mesozoic sandstone leave no doubt as to the general position of the boundary line between these measures.

Commencing the line at the centre of the town, we have, at 1,000 feet towards Gettysburg, fragments of quartzite, with *Scolithus*.

At 2,000 feet the soil exhibits a very gradual increase in red color. Fragments of quartzite and quartz conglomerate are found.

At 2,880 feet occurs the projection of Minter's, and at 3,800 feet of Comfort's ore.

Obs. & stations	Cleavage.	Dip.	Character of Rock.	Dist'ce in feet from starting pt. of section.	Provisional field number of specimens in collection.
			Cashtown. Fragments of older rocks Fragments of quartzite, with <i>scolithus</i> . Soil changes gradually to red. Quartzose sandstone and sandy conglomerate projection of Miner's ore.....	0 1,000 2,000 2,880 614; 100 wall, 616, 611, 635, 623	
	N. W. 28°		Projection of Comfort's ore Fragments of red sandstone, quartzite, and sandstone with <i>scolithus</i> . Green argillaceous sandstone..... Red argillaceous sandstone..... Fragments of sandstone and quartzite, with <i>scolithus</i> and of argillaceous sandstone. Red sandstone..... Fragments of quartzite and red shale. M'Knightstown..... Red sandstone and fragments of milky quartz. Red soil quartzite and pebbles of milk quartz..... Red soil and fragments of quartzite..... Red soil..... Fragments of greenish yellow shale..... Fragments of greenish yellow shale..... Red sandy shale..... "Seven Stars," Inn.	3,800 5,480 5,580 6,230 9,080 10,880 10,900 12,560 14,160 14,760 16,260 16,740 17,880 19,360 20,000 21,105 21,905	
	W. 30° N.—20°		W. 20° N.—20°		
	W. 30° N.—30°				
	W. 20° N.—25°				
	W. 40° N.—20°				





Obs. Variations	Cleavage.	Dip.	Character of Rock.	Dist'ce in feet from starting pt. of section.	Provisional field number of specimens in collection.
20 C.			Crossing of Marsh creek.....	22,705	
			Red soil.	24,830	1,160
			Boulders of trap.	25,005	1,289
			Green sandstone.....	25,180	1,298
			Red sandstone and fragments of pink sandstone.....	26,200	
			Pinkish sandstone containing epidote.....	26,400	
			Purplish shale.....	27,480	
			Red shale (very sandy).....	28,880	
			Brownish sandy shale.....	28,980	
			Greenish brown shale.....	29,880	
			Yellowish green shale.....	30,080	
			Fed sandy shale.....	30,080	
			Greenish shale, gradually merging into purple.....	30,280	
			Red shale.	30,580	
			Dyke (?) of trap.....	31,380	
			Sandy red shale and greenish brown shale, becomes green.....	32,480	
			as it approaches the trap.....	34,080	
			Sandy purplish shale.....	34,680	
			Fed sandy shale.....	35,380	
			Willoughby's run, red soil.....	36,680	
			Red sandy shale.....	37,030	
			Red shale.....	39,630	
			Red shale, gradually merging into purple and then to red.....	41,070	
			Blue shale, Trap.....		
			Purple shale changes to blue.....		
			Red shale, etc.		
			Red shale.....		
			Centre square.....		
			Gettysburg.....		

The topographical features of this section line between Cash-town and Gettysburg would seem to indicate a larger number of trap ridges than are here mentioned as having been passed over, and no doubt there are several such ridges made by the greater or less induration of the Mesozoic rocks by contact with molten matter, which either never reached the surface or of which the traces have since been destroyed by erosion.

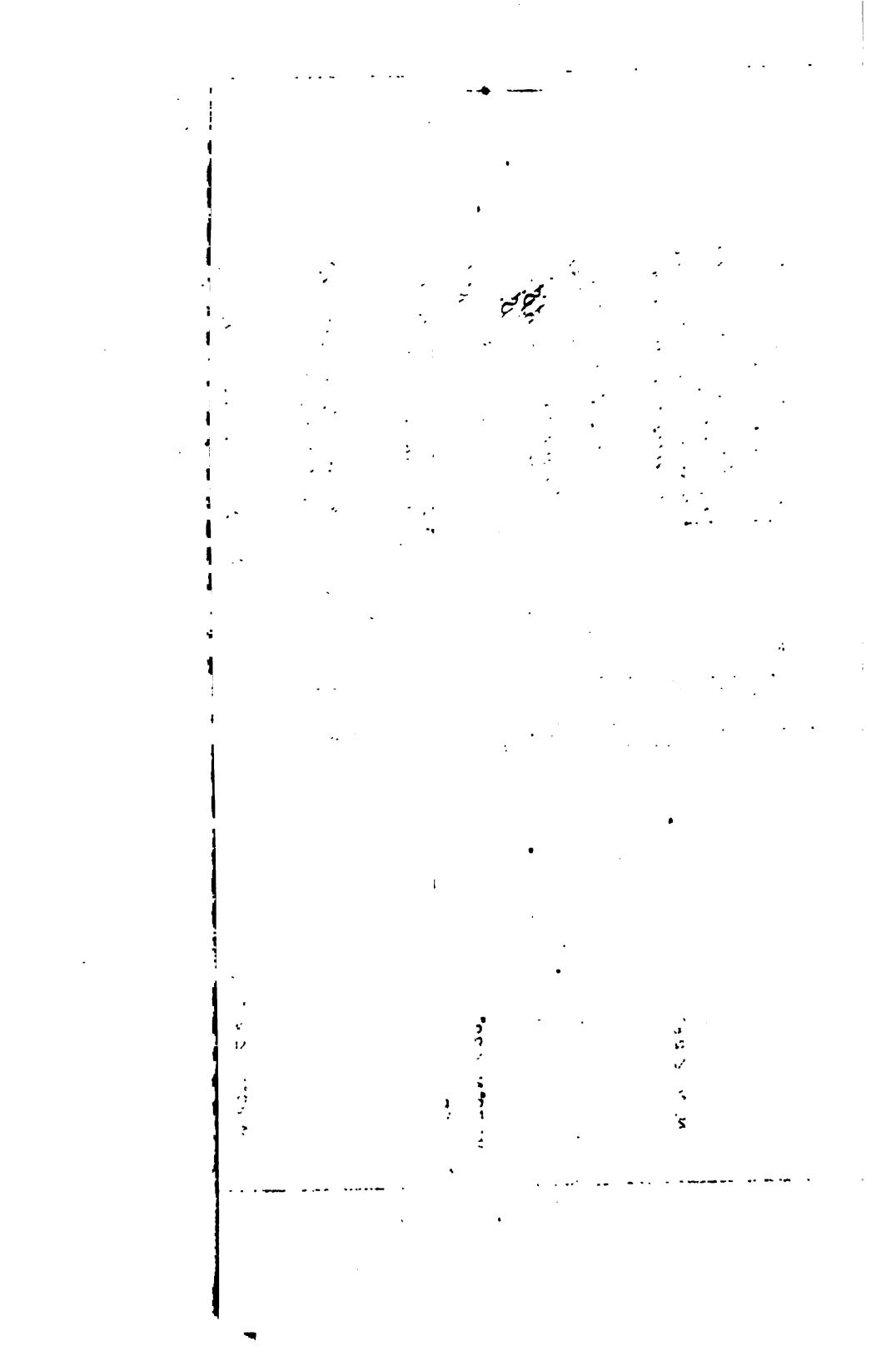
It is not impossible that masses of sedimentary rocks extending to considerable depths may have been baked from above by surface overflows of molten trap, similar to those which produce the "*Mesas*" of Colorado and New Mexico, and that afterwards the whole of these horizontal plates of hard rock may have been planed off and carried away, together with part of the extremities of the inclined strata upon which such plates rested. Besides this, however, we must consider that rocks of certain composition are more easily altered or indurated than others, and that the same amount of heat transferred to both kinds would produce much greater hardness, and capacity to resist attrition in one than in the other, so that if this *mesa* hypothesis be not deemed untenable it would seem to account for the presence of hills and dales, the former caused by hard rocks, altered by heat, though the agent which supplied this heat had entirely disappeared.

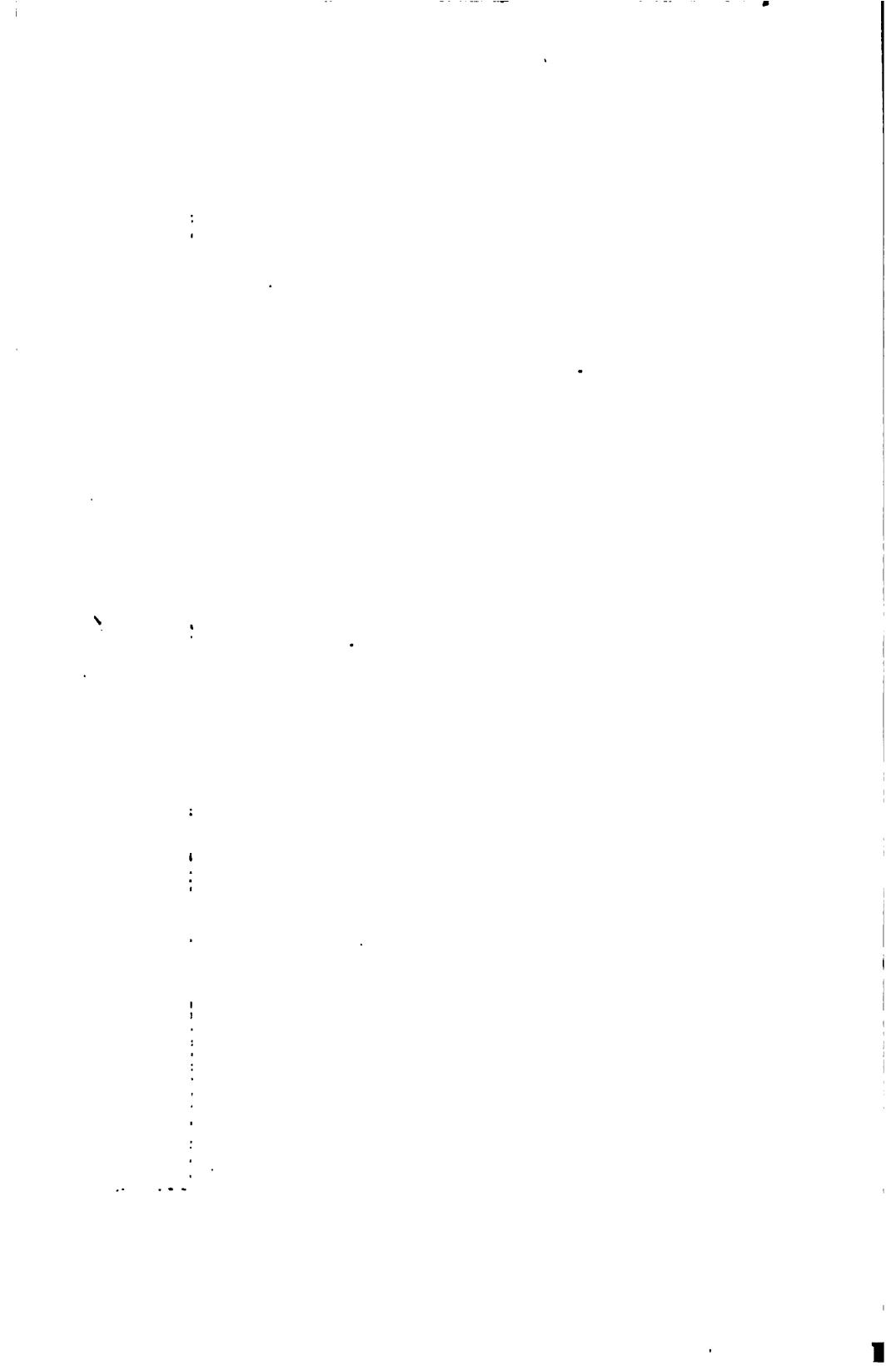
A careful examination of the trap dyke which makes Seminary Ridge in the cutting made for the old "Tape Worm" railroad elicited the following facts:

A sketch and description of this cut is given in the 2d volume, part II, of H. D. Rogers' final report, but then the observer was impressed differently as regards the parts which were altered and those which were of true igneous origin. (pp. 691 and 913 Rogers' Report, Vol. II, Part 2.)

On the two pages above mentioned are cuts, each of which is apparently intended to represent this same portion of the ridge, but they are not identical, for whereas that on p. 691 is represented without a fault, the other shows a fault of strange shape.

The text accompanying the former of these cuts gives the trap as 150 feet wide, with 50 feet of altered sandstone on each side of it, gradually passing into the normal red sandstone of





the region. The following is the description of its appearance June 9, 1875:

The railroad cutting through the Seminary Ridge is 600 feet long, and for the north-west half of this distance the red sandstone is seen to dip gently north-west. In the middle is a bluish indurated mud rock, with about the same dip, and from this point for 50 feet to the south-east the sides of the cut are so completely decomposed to earth that the nature of the rock is not clearly distinguishable.

The rock underlying these debris appears to be a trap of alteration; that is, a sandstone originally altered to a trap by heat and pressure, and subsequently partly disintegrated on the outside, so as to resemble a sandstone, and leaving two planes of cleavage perpendicular to the bed planes of the adjacent strata.

Many boulders of dolerite of over two tons in weight, and exhibiting fresh surfaces of fracture, lie in the cut, and probably have been detached recently from the true dyke whose edges are now covered.

The foot and hanging wall of this dyke appear to dip south-east, and this looks as if the dyke had followed a plane of cleavage to the surface, a phenomenon closely allied to that of the opposite directions of dip of trap and sandstone observed and remarked in the vicinity of the ore mines near Dillsburg.

According to this view, there are not, at the highest estimate, more than 50 feet of true trap, the rest being merely altered or indurated rocks for 50 feet or more on either hand. The cleavage planes parallel with that of the dyke fade rapidly and soon disappear, both east and west of the latter.

### *Section 12.*

This section, which is a complement to Section 11a, and with it spans the New Red Sandstone belt, commences at Gettysburg and runs nine and one-tenth miles to Littlestown, but dips were obtained only over a part of this distance, viz: from a point 3 miles S.  $24^{\circ}$  W. of Gettysburg to a point 1 mile N.  $11^{\circ}$  E. of Littlestown. Proceeding from the square of Gettysburg outwards to where the dips on the line actually commence, we have:

Observations	Cleavage.	Dip.	Character of Rock.	Dist'ce in field num ber of spec imens in collection.
			Projection on this line of Gettysburg Square, Red Shales and Sandstone. Projection on this line of National Cemetery, Trap and Shales. Dolerite coarse grained. Outcrops and yellow soil. Soil changes from yellow to purplish. Fragments of blue mud rock and sandstone. Rock Creek. Fragments of bluish argillaceous sandstone and mud rock with epidote. Blue mud rock and fragments of red sandstone.	0 1,400 2,600 5,720 7,960 1,092 8,400 9,600 1,093 9,600 1,094 11,120 1,095
			Reddish sandstone. Dolerite 8 feet wide. Red shale on both sides. Red soil.	12,295 1,096 12,570 12,915 13,471 14,145
			W. 35° N.—40° W. 35° N.—10° Argillaceous sandstone. W. 35° N.—25° Very argillaceous red sandstone. W. 35° N.—20° Red shale. White Run. Red soil. Red shale. Red shale. Red soil with fragments of shales. Red sandy shale finely laminated. Red soil and fragments of red shale. Red shale. Red shale. Fine grained yellow and green sandstone.	17,720 1,233 17,720 18,295 18,370 18,670 19,420
S. 45° E.—65°			W. 25° N.—20° W. 30° N.—15° W. 15° N.—15° W. 15° N.—15° W. 25° N.—15° W. 30° N.—20°	

Observations.	Cleavage.	Dip.	Character of Rock.	Dist'ce in Provisional field num- ber starting of spec- imens in collection.
E. 5° S.—75°	W. 30° N.—15°		Yellowish green sandy shale 15 feet wide, followed by green shale 15 inches wide.....	19, 620 1,236
E. 15° S.—85°	W. 20° N.—15°		Red shale 75 feet. Green shale 30 feet, then red shale. Sandy, Red shale.....	19, 920 1,237
E. 15° S.—70°	W. 25° N.—10°		Sandy red shale.....	20, 320
E. 15° S.—65°	W. 20° N.—20°		Sandy red shale.....	20, 728 1,238
E. 15° S.—65°	W. 15° N.—15°		Sandy red shale.....	21, 070
E. 20° S.—65°	W. 15° N.—20°		Sandy red shale.....	21, 720
E. 5° S.—85°	W. 25° N.—25°		Sandy red shale.....	22, 320
E. 5° S.—85°	W. 20° N.—30°		Purplish very sandy gray shale.....	22, 945
E. 15° N.—15°	W. 15° N.—180°		Red sandy shale.....	23, 095
E. 20° N.—180°	W. 20° N.—180°		Yellowish green sandy shale. Finely laminated.....	24, 505
E. 20° N.—180°	W. 25° N.—150°		Red shale, 150 feet; yellowish green shale, 50 feet.....	24, 820
E. 20° N.—180°	W. 20° N.—250°		Red shale.....	25, 970
E. 20° N.—180°	W. 25° N.—300°		Red shale.....	27, 020
E.—85°	W. 20° N.—200°		Reddish and greenish sandstone with spangles of mica.....	27, 620
E. 15° N.—20°	W. 25° N.—200°		Sandy red shale.....	27, 770 1,240
E. 15° N.—30°	W. 15° N.—30°		Sandy red shale.....	27, 870
E. 15° S.—80°	W. 35° N.—30°		Fragments of red sandstone and shale.....	28, 270
E. 15° S.—80°	W. 20° N.—20°		Red argillaceous sandstone.....	30, 945 1,304
E. 15° S.—80°	W. 20° N.—25°		Red argillaceous sandstone.....	31, 620
N. 15° W.—70°	W. 15° N.—220°		Yellowish green sandstone 200 feet, followed by red shale.....	33, 000
N. 15° W.—70°	W. 15° N.—220°		Sandy red shale.....	35, 270
N. 15° W.—70°	W. 20° N.—25°		Yellowish green sandstone.....	35, 345
N. 15° W.—70°	W. 20° N.—20°		Yellowish green coarse grained sandstone.....	36, 120 1,306
N. 15° W.—70°	W. 15° N.—20°		Fragments of above. Red soil with fragments of above.....	38, 420
N. 15° W.—70°	W. 15° N.—25°		Yellowish green coarse grained sandstone.....	38, 545
	W. 15° N.—20°		Yellowish green sandy shale extending over 225 feet.....	39, 720
	W. 15° N.—20°		Red shale.....	39, 920

OBSERVATIONS.	Cleavage.	Dip.	Character of Rock.	Provisional Dist'ce in field num- ber from starting p't of sec- tion.	
				feet	speci- mens in collection..
			W. 15° N.-30° W. 15° N.-25° W. 20° N.-20° W. 15° N.-25°	Red shale..... Yellowish green shale. Bed shale and fragments of greenish yellow sandstone..... Greenish yellow sandstone.....	40,600
				Red soil and fragments, Red shale..... Littlestown.....	41,186 41,920 43,220 46,180

In glancing over this part of the section of the Mesozoic belt, which crosses this State and extends north-east across New Jersey into New York, and south-west across Maryland into Virginia, there is very little material on which to base hypotheses. There appear to be a remarkable uniformity of north-west dips, broken only by the intrusion of igneous matter and by planes of cleavage ; and not a very great variety of rocks when regarded from a general point of view.

There seems to be decidedly more westing in the direction of the dip of the measures on the eastern side of the Mesozoic basin than on the western side. A comparison of the dips taken in sections Nos. 10 $\alpha$  and 12 will show this. The average of twenty-five dips taken from Cashtown to Gettysburg gives a direction of W. 35.4° N.—22.44°, whereas the average of forty-five dips between Gettysburg and Littlestown gives W. 22.5° N.—20.76°.

It is significant that the intensity remains nearly the same in these two parts of the estuary, while there is a variation of about 13° in direction. The deductions of Dana and others as to the supposed enormous thickness of these deposits seems to be confirmed by these facts, and yet there is good reason for believing from the observations on this formation made by Mr. Heinrichs, of Virginia, and especially from his exploitations with the Diamond drill ; that the normal thickness of the New Red Sandstone, in this part of America at least, will be found not very much to exceed 1,500 feet, though if there be nothing but a continuous series of superposed layers this section alone would require them to be over three miles (or 16,400 feet) thick, and section 11 $\alpha$  somewhat more.

The only safe method of settling this very important question of the thickness of these measures is by boring.

Three or four bore holes judiciously located and pushed through the Mesozoic sandstones would not only be of the greatest service in settling the present position of this formation, but would serve to answer many questions of economic importance, as well as those relating to the genesis of these most curious rocks.

The following are some of these questions demanding solution :

What is the actual thickness of the Mesozoic series at its middle point ?

Does it thin out towards both edges?

What is the contour of its bottom?

Are the iron ores of this formation all deposited between bed plates, or in cleavage planes, or in both?

Is the bed rock upon which this series rests the same from one extremity of the basin to the other, or do rocks of different ages form its bed at different localities?

How far continuous in a lateral direction are the copper, iron, fossils and coal?

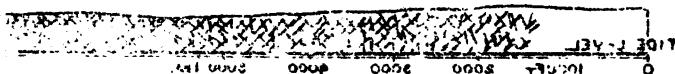
Are different periods of Mesozoic time represented in different portions of the New Red Sandstone?

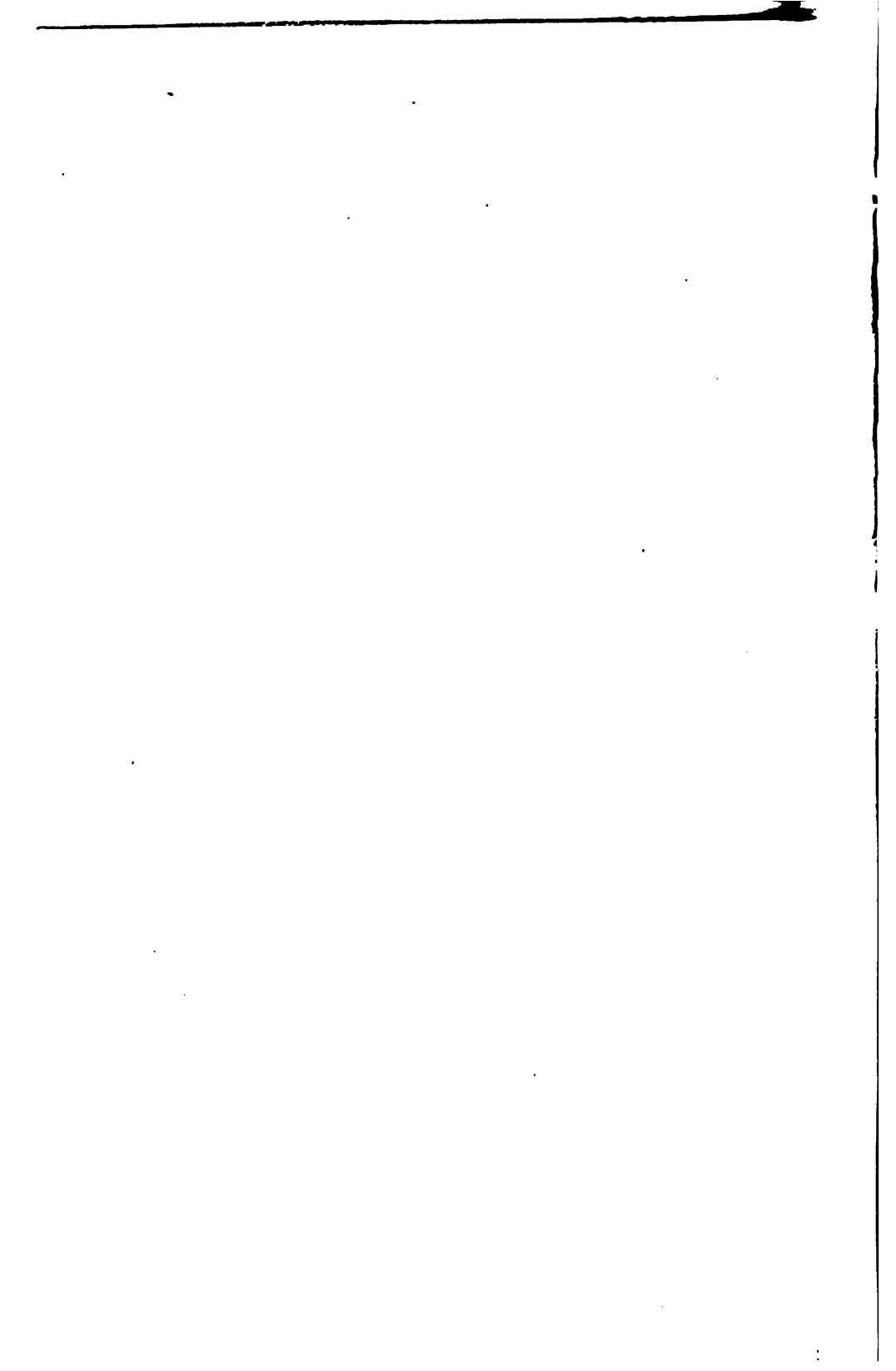
## SECTION

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## CHAPTER XII.

*Description of Rocks.*

The rocks which formed the objects of investigation during the season of 1875 belonged to the same three ages which were touched upon in the previous report, nevertheless few analyses of these were finished in time for this continuation of it.

## LIMESTONES.

Some very interesting speculations have been made as to the limestones of the pristine earth, and the condition of the earth's crust during the production of dolomites, (see Dr. T. Sterry Hunt's Chemical and Geological Essays,) and it is clear that the subject is worthy of careful study.

Another line of investigation of great importance is the influence which dolomitic limestone must exercise on the topography of a country. Prof. Lesley has shown the important part in the production of the present surface that the slow solution and destruction of the limestones of the earth below water level, with the consequent caving in of the strata which rest on them, has played.

It is easy to see that different kinds of effects would be produced by the rapid waste of pure carbonate of lime and the slower destruction of magnesian or dolomitic rocks. And the effect of water on either of them singly would not resemble that on their combination in separate layers or benches, an association in which they are so frequently found in the great valleys of Silurian and pre-Silurian rocks on the Atlantic border.

As these limestones of the Cumberland and York Valleys are more thoroughly investigated, the heterogeneous character of the layers which compose them will be much more perfectly understood.

I have sought to ascertain the horizon of a given stratum in these measures by ascertaining its percentage of magnesium, and, indeed, were any such test reliable, it would be of the greatest importance for the stratigraphical geologist.

With the purpose of submitting to this test as many of the limestones as possible, I made a selection of representatives of the principal beds whose place in the series has been established by the party of York, Franklin and Adams counties. Their names are as follows:

No. 1 is a sandy limestone from the west branch of Creitz's creek, in the town of Wrightsville. If the interpretation of the structure given in my Report of Progress for 1874 be correct, this limestone belongs at or near the base of the "Auroral" series, and immediately above the chlorite and hydro-mica schists.

No. 2 is a specimen taken from the upper bench of a quarry near Pine Grove Furnace, Cumberland county. It probably represents one of the higher beds of the "Auroral." Upon it was found crystallized calcite containing over 98 per cent of  $\text{CaCo}_3$ , with hardly a trace of magnesia.

No. 3 is a specimen taken from a lower bench (perhaps 25 feet perpendicular to the measures) of the same quarry.

No. 4 is an example of the white or buff-colored limestones which occur, together with the blue limestones, often in the same quarry, but, nevertheless, usually exhibiting indications of unconformability with them. These limestones are usually poor in magnesia.

No. 5 is taken from Detweiler's quarry, north of the Columbia bridge, in Wrightsville. Its position is, in all probability, midway between the upper and lower benches of the Auroral limestone.

No. 6 is taken from Detweiler's quarry, south of Wrightsville, and is (as its analysis shows) a calcareous slate underlying one of the many belts of the formation.

The limestone slates which occur with this one in the foot of the quarry are remarkable for the very large amount of pyrite crystals which they contain. Some of these crystals are half an inch on one edge.

The specific gravity was determined with care.

\*For this determination the specific gravity bottle was not employed, its mission being considered rather to obtain the density of chemically homogeneous compounds. For determinations of the specific gravity of rocks, coals, etc., etc., whose weight becomes an important item in their transportation for the great industries, it was believed that the weight of a given bulk could be more accurately determined without taking especial care to exclude the air with which they are partly filled.

## ANALYSIS OF LIMESTONES.

	Sandy Limestone, west branch of Creitz's creek. No. 1.	Pine Grove quarry, upper bench. No. 2.	Pine Grove quarry, lower bench. No. 3.	White Limestone, 100 yds E. of Bee- ler's Cross-roads. No. 4.	Detweiler's quarry north-west of Wrightsville. No. 5.	Detweiler's quarry south of Wrights- ville. No. 6.
Specific gravity (in lump)..	2.832	2.735	2.731	2.750	2.737	2.770
Insoluble siliceous residue..	4.400	12.270	12.000	3.570	0.490	41.710
Alumina and ferric oxide..	1.170	1.540	0.450	0.210	1.440	6.350
Carbonate of lime.....	49.920	†75.320	81.617	§91.580	91.400	43.728
Carbonate of magnesia.....	42.980	10.750	6.400	¶4.110	7.290	6.450
Sulphur .....	0.220	0.120	0.422	0.113	0.003	1.480
Sum.....	98.690	100.000	100.489	99.583	100.623	99.718
Undetermined and loss.....	1.31	.....	0.489	0.417	0.623	0.282
Excess .....	.....	.....	.....	.....	.....	.....
Metallic iron .....	0.354	0.698	.....	.....	0.196	1.827
Alumina.....	0.505	0.541	.....	.....	1.454	3.740

Determinations of the carbonate of lime and magnesia in these rocks were made independently by Mr. D. M'Creath, and are as follows :

\*In all the subjoined specific gravity determinations, fragments weighing from 3 grammes to 12 grammes, were gently warmed and turned over in distilled water and set aside for 24 hours.

The temperature of the water in which the seconda weighing took place, was 62° Fah.

† Determined by Mr. David M'Creath.

‡ By loss. 73.6 as determined directly by Mr. D. M'Creath.

§ Mean of two determinations.

¶ Determined by Mr. D. M'Creath.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Calcium carbonate.....	49.92	73.60	86.39	91.67	91.25	44.50
Magnesium carbonate.....	42.98	10.98	6.42	4.11	7.58	8.56
Silica.....					0.760	*
Some sesquioxide.....					0.196	.....

I am indebted to Dr. Cresson for his courtesy in offering the facilities of his laboratory for this investigation.

As a supplement to this table the following is taken from p. 113 of my Report of Progress in the District of York and Adams for 1874.†

#### LIMESTONES.

7. New Red Sandstone near Dillsburg, foot of MacWilliams' slope.

8. Opposite Allison's Mill, Xenia P. O., York county.

9. From Shaft No. 5, three-fourths of a mile east from Mont Alto furnace.

10. Half a mile south of Seitzland, in a cutting of the N. C. R. R. (A calcite very similar to that above described as occurring on the upper bench of the Pine Grove quarry is found here.)

	VII.	VIII.	IX.	X.
Calcium carbonate .....	73.18	62.35	77.89	93.87
Magnesium carbonate.....	4.37	6.32	2.83	0.96
Metallic iron.....	0.52	5.27	1.33	0.30
Insoluble siliceous residue.....	21.50	20.06	15.89	4.30
Sum .....	99.57	94.00	97.94	99.43
Oxygen, organic matter, water and loss .....	0.43	6.00	2.06	6.57

#### Roofing Slates.

Mr. Benade, of Hanover, opened a slate quarry‡ about three-fourths of a mile east by north of the cross-roads near Hofacker's mine, and a line was run from the latter place (which was located on the map of last year) to the quarry for the purpose of

\* Some sulphide is present, as sulphhydric acid is produced when the rock is treated with hydrochloric acid.

† These analyses were made by Mr. A. S. M'Creadh, Chemist of the Second Geological Survey of Pennsylvania.

‡ This quarry is briefly alluded to on p. 101 of the report for 1874.

determining its geological position with reference to other rocks described in the report for 1874.

The quarry is on the right (north-east bank of a small tributary of the west branch of the Codorus, on the steep side of a hill.

The rock is a soft chloritic hydro-mica schist. Two dips, taken at different parts of the quarry, gave—

S. 30° E.—76°

S. 30° E.—82°

The average dip might be best stated at S. 30° to 40° E.—76° to 82°.

At the time of the examination (July 8, 1875,) ten men were employed in the quarry and three men in the dressing works. Slates were cut from 6"×7"× $\frac{1}{4}$ " to 14"×24"× $\frac{1}{4}$ ".

The average thickness was about a quarter of an inch. The prices paid for them were from \$5 00 to \$7 00 per hundred square feet. There were then stored from 35 to 40 "squares" (*i. e.*, 100 square feet,) and the quarry was then paying expenses.

One of the station houses on the newly constructed Short Line railroad, between York and Hanover, was said to be tiled with this slates and the latter to be satisfactory.

#### *Microscopic Examination of Rocks.*

The collection of rocks during the season of 1875 considerably exceeded 1,000 specimens, and on the return of the party from the field, by the permission of the Chief Geologist, I engaged a large and well lighted room, (615 Walnut street,) where after unpacking and laying out the collection, suitable apparatus was provided for making thin sections of as many of the specimens as permitted this kind of study. Where it was possible to do it, duplicates of the sections were made, both in order to enable a better study to be made of them, and also to put it in the power of the Board to exchange specimens for similar sections from other localities.

It is hardly necessary to say that most of the rocks which were prepared for study under the microscope were traps or basic igneous rocks.

Dr. Genth has commenced the analyses of some of them, and it is hoped to carry on the microscopic examination systemati-

cally until the greater number of the traps of Pennsylvania have been reviewed.

An important addition to our knowledge, by Dr. Genth, may, however, with propriety, be mentioned here.

In discussing the constitution of the traps in my report for last year I compared the "Bausch" analysis of the dolerite obtained near Beeler's, York county, with an hypothetical mixture, containing two molecules of labradorite and one of pyroxene. The constitution of the latter of these minerals was assumed to be that determined as the constitution of a pyroxene occurring in a dolerite of Connecticut; while a mean of forty analyses of labradorite, as given in Dana's Hand-Book of Mineralogy was calculated to represent the other constituent. Since then enough material has been extracted from specimens of traps sent by me to Dr. Genth to enable him to determine the constitution of the labradorite and pyroxene as they occur in our own traps.

The following parallel tables exhibit the differences in percentage between these and the data made use of in the last report:

	Feldspar selected from dolerite near Gettys- burg.—(Dr. Genth.)	Average of forty an- alyses of labradorite from all localities.— Dana's Mineralogy.	Per cent.
	a.	b.	
Silicic oxide .....	54.05	53.85	53.00
Alumina .....	28.81	28.91	27.96
Ferrous oxide.....	1.36	1.16	(Ferric) 1.33
Magnesia .....	0.26	0.22	0.93
Lime .....	11.05	11.79	10.88
Soda .....	3.36	3.23	4.09
Potash.....	0.59	0.77	1.08
Ignition .....	0.45	0.76	(Water) 0.84
Total .....	99.93	100.69	99.39

Specimen (a) was taken from the north side of "Devil's Den."

Specimen (b) from the west side of "Round Top."

The agreement of the results of these evidently careful and valuable analyses of Dr. Genth with those of the calculated mean is very close and confirms the opinion heretofore expressed with regard to the relation of labradorite to the traps of this region.

The brown amphotericite heretofore considered pyroxene from its behavior under the microscope in this section has also been extracted from specimens taken, (like specimen (a) of the labradorite analysis,) from the north side of Devil's Den, three miles

south of Gettysburg. The comparison of this with the Connecticut pyroxene from the trap analysed by Mr. Hawes, is rendered easy by the following tables:

	Devil's Den, Dr. Genth.	Connecticut Trap, Mr. Hawes.
Silicic oxide .....	51.64	50.71
Alumina.....	4.23	3.84
Ferrous oxide .....	16.04	15.30
Magnesia.....	15.93	13.63
Lime .....	10.05	13.35
Manganous oxide.....	<hr/>	.81
Soda.....	0.46	
Potash.....	0.16	2.56
Ignition .....	0.72	
Loss .....	0.77	
 Sum.....	100.00	100,00

The traps in the vicinity of Gettysburg, and especially in the neighborhood of the Devil's Den, were found last season to exhibit a peculiar kind of weathering whereby the faces of large rocks were crossed by more or less regular furrows from one-half inch to an inch in depth, giving the boulders and cliffs thus weathered the appearance of being built up of separate blocks, after the manner of a Cyclopean wall. It was also noticed that between these furrows the rock consisted of one or more superposed shells conchoidal in form, and ready at a blow from a hammer to fall off from the nucleus. It was naturally thought that this peeling off of the outer surface of the rocks thus affected was due to the action of the sun on that side, in expanding the surface superficial parts more than the interior, while the net-work of furrows, it was thought, could be accounted for by the unequal resistance of different lines across the face of the rock to the dissolving and abrading action of the rains with their suspended sand. An examination of these superficially altered rocks showed that the sides thus affected were mainly those which were turned to the south and east.

It is not clear why the south-east faces should be more subject to this action than those of the south-west, for the prevailing thunder showers come from the west. However, statistics of the mean annual direction of the rain storms are not at hand to decide the question.

An interesting specimen of dolerite intersected by a vein of quartz was found.

The specimen exhibits a central band of quartz, (part of which appears to be hyaline and part anhydrous,) enclosing within it small fragments of dolerite similar to that in which itself is enclosed. Between this central quartz vein and the dole-rite on either side, is a band of darker color also containing small fragments of the trap. Beyond these bands are broad margins of unaltered dolerite on either side, in which minute quartz veins can be detected. This specimen would seem to show that the quartz was deposited at a temperature at which it was not capable of combining with the basic compounds in contact with it except by that slow process which is well known to produce silicate of lime from the contact of quick lime and sand in the slow setting of mortar. The deposit was probably from aqueous solution, and the darker bands separating the quartz and rap may very likely be the product of this slow combination.

Another specimen of great interest is a block of sandstone from the Mesozoic series, in which an irregular portion at one end appears to blend into and gradually become a coarsely crystallized syenite. This specimen was obtained from the vicinity of Harman's blacksmith shop, in the north-western corner of York county. There is some considerable obscurity as to the distinctions to be made between those traps which have been cooled from a molten mass and those which have been altered in time under pressure and at high temperatures. There seems no perfectly satisfactory manner of distinguishing the one class frotn the other, whether by chemical analysis or otherwise.

#### *Chloritoid.*

A chloritoid has been analysed by Dr. Genth from specimens obtained by me from near Whitestown, at the Centre Mills Ore Bank. The rock in which these scales of chloritoid occur are of Mesozoic age, though most of their constituents have been obtained by *re-making* the older crystalline schists. They are sandstones and shales stained dark brown, green or black on the surfaces or clefts. With these is associated a hard, brittle, fine grained, sandy slate, containing lumps of feldspar, mica, chlo-rite and magnetite (?). The specimen from which the chloritoid was extracted, was one of a large number strewn over the sur-face and not certainly in place.

The specific gravity of the mineral was found by Dr. Genth to be 3.197.

Silicic oxide .....	28.19
Alumina.....	37.67
Ferrio oxide .....	3.12
Ferrous oxide .....	22.21
Manganous oxide .....	trace.
Magnesia....:	2.28
Water .....	6.53
Total .....	100.00

Dr. Genth adds, (see his report), that 5.91 per cent of silica, and 1.92 per cent of titanic oxide were deducted from the results of the analysis. The former being supposed to be present as quartz, and the latter as rutile.

#### *Mineral Waters.*

A number of spots in this district are remarkable as the sites of springs supposed to possess medicinal virtues. Of these the springs near Gettysburg are the most notorious. The Katalysine Spring is situated about half a mile west of the Theological Seminary. It is generally a moderately strong flowing spring, which breaks out from between the Triassic-Jurassic shales and flows into Willoughby's Run close by. Its curative powers were not discovered until after the celebrated three days' battle had made Gettysburg famous.

From a little book advertising the Spring, and issued from Philadelphia in 1872, the following analysis of the water, by Prof. A. M. Mayer, is given, and alongside of it the analysis made subsequently for the owners by Dr. F. A. Genth.

In the following table the two published analyses of this water are compared. One imperial gallon, of 231 cubic inches, gave—

Prof. A. M. Mayer. Grains.	Dr. F. A. Genth. Grains.
Barium sulphate .....	trace.
Strontium sulphate.....	—
Calcium sulphate .....	53.20
Magnesium sulphate .....	—
Potassium sulphate.....	—
Sodium sulphate .....	—
Sodium chloride.....	0.65790
Lithium chloride..... }	trace.
Sodium bicarbonate .....	—
Calcium bicarbonate.....	81.00
Magnesium bicarbonate.....	76.05
Iron bicarbonate.....	0.0385

	Prof. M. A. Mayer. Grains.	Dr. F. A. Genth. Grains.
Manganese bicarbonate .....	—	0.00669
Nickel bicarbonate .....	—	trace.
Cobalt bicarbonate.....	—	trace.
Copper bicarbonate .....	—	0.00050
Magnesium borate.....	—	0.03492
Calcium phosphate .....	trace.	0.00379
Calcium fluoride.....	—	0.00954
Alumina.....	—	0.00380
Silicic oxide .....	10.00	2.03078
Organic matter, with traces of nitric acid .....	—	0.70870
Impurities suspended in water like clay, etc.....	—	1.10069
Sodium and lithium bicarbonate,	46.05	—
Potassium bicarbonate .....	trace.	—
Total.....	266.30	32.54272

After giving these results (but not in columns for comparison) the advertisement for 1873 adds: "The reports of these analytical chemists present *the usual diversity of results* of chemical analysis conducted by different persons."\*

The water is a clear, tasteless, odorless water, of which the mean temperature is 57° Fah.

This temperature is interesting from the fact that it is some six degrees higher than the average temperature of those springs which were examined in this district. But the others were situated on or near the mountains and close to or beyond the margin of the New Red Sandstone.

The whole question of springs is an important one in a geological, as well as an economical, point of view, and it is hoped that new data on this subject will be collected during the course of the next year. It is interesting to know the causes which combine to cool the rain which falls and from which these springs are derived. It is quite probable that under otherwise similar conditions, such as length of course under ground, equal depth of sources, etc., two springs in different formations will have different mean temperatures. But whether, as has been asserted, this temperature will be the mean annual temperature of the region requires additional facts to determine.

#### Gettysburg Lithia Spring.

This spring is situated about half a mile north-west of the

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\*It is proper to add that in the new edition of the little pamphlet now circulated only Prof. Genth's analysis finds a place.

Katalysine spring, and a short distance north of the Gettysburg-Chambersburg turnpike. The basin has been excavated for the water in the same argillaceous sandstones, and the water fills it to a depth of about three feet. The property is owned by Mr. Stremmel.

An analysis of this water had been made as follows by Prof. Oscar Oldsberg, Prof. of Chemistry in Howard University, Washington, D. C.:

One litre contained,

	Centigramans.
Sodium bicarbonate.....	8.509
Magnesium bicarbonate.....	12.512
Calcium bicarbonate.....	13.697
Iron bicarbonate.....	0.085
Calcium sulphate.....	9.431
Sodium sulphate.....	0.342
Potassium chloride .....	0.183
Lithia.....	trace.
Silica .....	0.237

A sample of this water was procured by myself in a five gallon demijohn, which had been half a dozen times well rinsed out with the water, and forwarded to Dr. Genth for analysis, which here follows, together with the preceding reduced to grains to the gallon for the purpose of better comparison.

One gallon of 231 cubic inches contains,

	GRAINS.	
	Dr. F. A. Genth.	Prof. O. Oldsberg.
Calcium sulphate.....	0.47998	0.25176
Magnesium sulphate.....	3.30063	—
Potassium sulphate.....	0.14984	—
Sodium chloride.....	0.28209	—
Lithium chloride.....	trace.	Lithia, trace.
Sodium bicarbonate.....	3.20308	4.97045
Calcium bicarbonate.....	10.71144	8.00097
Magnesium bicarbonate.....	5.30595	7.30876
Iron bicarbonate.....	0.03116	0.04965
Silicic oxide.....	1.77606	0.16765
Sodium sulphate.....	—	0.19977
Potassium chloride.....	—	0.10690
Total matter dissolved in one gallon,	25.24023	21.05591

Dr. Genth adds: "The water was only examined for the principal constituents, which can be found in the quantity of water sent, not for the minute traces of boric acid, fluorine, &c., found in the Gettysburg Katalysine by evaporating over twenty gallons. Lithia can be shown by the spectroscope in the residue from one litre."

In the Mineralogy of Pennsylvania, 1875, Dr. F. A. Genth publishes a new analysis of this same spring, confirming his first results.

In one gallon of 231 cubic inches,

	Grains.
Magnesium sulphate .....	3.29559
Calcium sulphate.....	0.48243
Potassium sulphate.....	0.15399
Sodium chloride.....	0.31836
Lithium chloride.....	trace.
Iron bicarbonate.....	0.04203
Manganese bicarbonate.....	0.00485
Magnesium bicarbonate.....	5.82961
Calcium bicarbonate.....	9.95838
Sodium bicarbonate.....	3.37602
Calcium phosphate .....	0.00963
Alumina.....	0.02425
Silicic oxide .....	1.75473
	<hr/>
	25.24987

In a note concerning this analysis, Dr. Genth says "it is a new analysis which I made with the balance of the water you sent and with a larger quantity. It is more complete, as it has been tested for rarer substances.

The agreement between the analyses of Dr. Genth and of Prof. Oldsberg is very close, especially considering the difference of time and perhaps of season at which the two samples were taken.

#### *Medicinal Water of Hanover.*

Hanover, York county, in order not to be behind-hand with her sister town, to which nature seems to have been so bountiful, recommends the excellent water which is brought by pipes from the Pigeon Hills, distant about four miles, and furnishes the following analysis printed on a card recommending the place as a good abode for invalids.

Unfortunately, it is not stated how large a quantity of the water contains the following constituents. The analyst is Prof. Hollenbush, of Reading, Pennsylvania.

There were found (probably in one gallon):

	Grains.
Protoxide of iron.....	184
Protoxide of magnesia.....	21
Calcium carbonate.....	29
Sodium carbonate.....	trace.
Magnesium sulphate .....	42
*Albumena.....	16
To'al.....	<hr/> 292

\* Possibly meant for alumina.

## CHAPTER XIII.

*General Notes on the Geology of the Region.*

The magnetic and specular ores occurring within the boundaries of the Mesozoic Sandstone, and of which this little group of mines around Dillsburg constitute at once a striking example and an important fraction, differ from the exhibitions of these oxides in other formations in several particulars.

That they in their present state belong to the horizon of the Mesozoic series and to no other, seems to be beyond question; first, because the same variety of that micaceous ore which is so eminently characteristic of these deposits can almost always be traced in any iron-mining locality of this formation from massive plates filling more or less regular interstices between sand rocks, altered mudrocks, traps and shales; to scattered flakes of the same ore spread lightly over the inner surfaces of joints and cracks in the sedimentary beds of the above. Second; nowhere else is an exactly similar series to be found.

In his Final Report, Vol. II, Part 2d, p. 763, Prof. Rogers sums up the metalliferous veins of the Mesozoic Sandstone by remarking that they are not associated with dykes of trap rock, but are independent metalliferous injections. But in enumerating the different kinds of ores, singularly enough no mention is made of the iron ores, which are now under consideration, although some of those in the vicinity of Dillsburg have been wrought for a very long period. The ores of Cornwall and of the Jones mine are referred to the older formations.

The Dillsburg ores are all more or less soft lumps of specular and micaceous ore carried in clay. Their general appearance is dark dirty green, with streaks of black and glistening pulverulent ore. They are very irregularly deposited, but almost

or quite without exception are found between the plates of rock which make up this portion of the Mesozoic Sandstone.

An ideal section north from the Grove mine will reveal this. The region is very much covered with disintegrated rocks such as clay or sand, and very few surface exposures are to be found in the neighborhood of Dillsburg.

The rocks which have best resisted the weather have been the traps, and as a general rule in this region their dip corresponds to that of the beds between which they were poured out. Next to the trap (and sometimes even before it) in capacity to resist the disintegrating action of the water and atmosphere comes the altered and indurated mud rocks and argillaceous sandstones which frequently form the foot or hanging wall (or both) of these veins.

Commencing our line at the Grove slope and getting all the dips possible, both from rock in place and also from the angle of the slope itself, (an almost equally good plan, since the miner is sure to keep in the bed) the dip is about N.  $10^{\circ}$  E.— $24^{\circ}$ .

For about 2,200 feet north no mines are observable; but here occurs the projection of the Bell slope, in which the hanging and foot walls dip about N.  $10^{\circ}$  E.— $20^{\circ}$ .

Supposing these two mines to be in two different veins of ore, and to be continuous, their horizons in the measures would be at a perpendicular distance of 750 feet apart.

Again for 1,400 feet northwards no ore mine is projected, and at a little over this distance occurs the old excavation, (the first in this vicinity to be exploited,) in which Mr. Underwood has recently sunk a new shaft.\*

The pit of this old working is about 15 feet deep, and the shaft is sunk from its lowest point for 25 feet, where a body of ore is said to have been struck. If so, and the dip of the rocks is here similar to that in the slope, the outcrops in the vein ought to be seen crossing the neck of the narrow southern prolongation of the pit about 80 feet south.

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\*There is an excavation between this and Bell's slope, but no accurate information in regard to it was obtained:

About 150 feet further north on this line occurs the projection of the ore in Underwood's slope, which is probably the same bed as that struck in Logan's shaft.

The enclosing rocks and the slope dip about  $28^{\circ}$  due north and the latter extends 290 feet below day, and proves the ore for that distance.

Five hundred feet a little E. of the mouth of Underwood's slope, on ground 30 feet below it, the Logan shaft has been sunk which reached the ore at 50 feet, from which point a slope was begun and extended downwards 80 feet at an angle of  $28^{\circ}$ , conforming to the dip of the measures.

Projecting this vein upwards it is found to intersect the surface on the same horizontal plane with the mouth of Underwood's slope, at a point 170.4 feet south of the mouth of the shaft.

Connecting this point with the point of outcrop of the Underwood vein by a supposititious outcrop-line, it is found to run E.  $8^{\circ}$  S., and the direction of dip of the vein to which it corresponds, is N.  $8^{\circ}$  E.

The coincidence of this direction with that of the Grove and Bell banks (N.  $10^{\circ}$  E.) is too striking to be overlooked, and leads to the conclusion that the true and false bedding of the rocks between these points are comparatively regular and the strata for over half a mile south of the Underwood-Logan ore are undisturbed by faults.

One hundred and sixty feet north-east of the Underwood slope is an excavation 140 feet in length north-east, and about 35 feet broad in its broadest part.

The Wrightsville Co. is said to have wrought this bank to a very considerable depth, and to have had 18 feet of ore in the bottom of it. It was not satisfactorily ascertained at what depth this ore occurred, and the settlement of this doubt has an important bearing on the question of the number of the ore veins here represented.

One hundred feet north of this latter opening (now a pond) is the southern margin of a very large excavation 100 feet long and 125 feet north and south.

Near the south-eastern corner of this pond, and high upon the bank, is the site of the former mouth of a slope. A little

west of north of it, and in the north-western angle, is the place of a former bore hole, (No. 5,) the record of which has been already given\*, and 50 feet north of this bore hole is a stake said to have been vertically over the slope. This stake bears N.  $3^{\circ} 30'$  west of the mouth of the slope, and if these data may be depended upon, indicates an alteration in the direction of the dip from that observed at the Grove and Bell slopes or  $11^{\circ} 30'$  to the westward.

One hundred and twenty-five feet north-west of bore hole No. 5 are two openings; the first an open cut long since abandoned, and a little south-west of it the mouth of a slope which was said to have been formerly driven 158 feet, at an angle of  $18^{\circ}$ , and to have been left in four feet of ore at a vertical depth beneath the surface of 60 feet.

If the  $18^{\circ}$  slope were maintained the vertical depth to the bottom of the slope would be 48 feet.

This ore, if carried down at the same angle of  $18^{\circ}$ , would coincide closely with the bed of ore said to have been struck in bore hole No. 4, at a depth of 74 feet and 2 inches. The thickness of the bed is reported to be 7.25 feet, which (allowing for the obliquity of its plane to the direction of the bore hole) would indicate that the ore has widened at that depth to 6.8 feet, a variation by no means uncommon. It may be assumed, therefore, that this ore has been proved for a distance of 260 feet on its slope.

One hundred and fifty feet from bore hole No. 4 occurs the long cut of M'Cormick & Co.

This cut has been opened 400 feet W.  $20^{\circ}$  N. along an outcrop of rock ore and two slopes have been driven downwards.

Both the direction and the strength of dip of this deposit are suddenly altered; the former being N.  $20^{\circ}$  W. and the latter  $45^{\circ}$ .

A slope of  $18^{\circ}$  was started from the cut and carried 30 feet, when a wall of hard trap (dolerite) was encountered, apparently cutting off the ore. Another slope was begun at an angle of  $45^{\circ}$ , and after proceeding a short distance the trap was again encountered and penetrated, and the vein beneath it.

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\* See page 216.



Plate 1

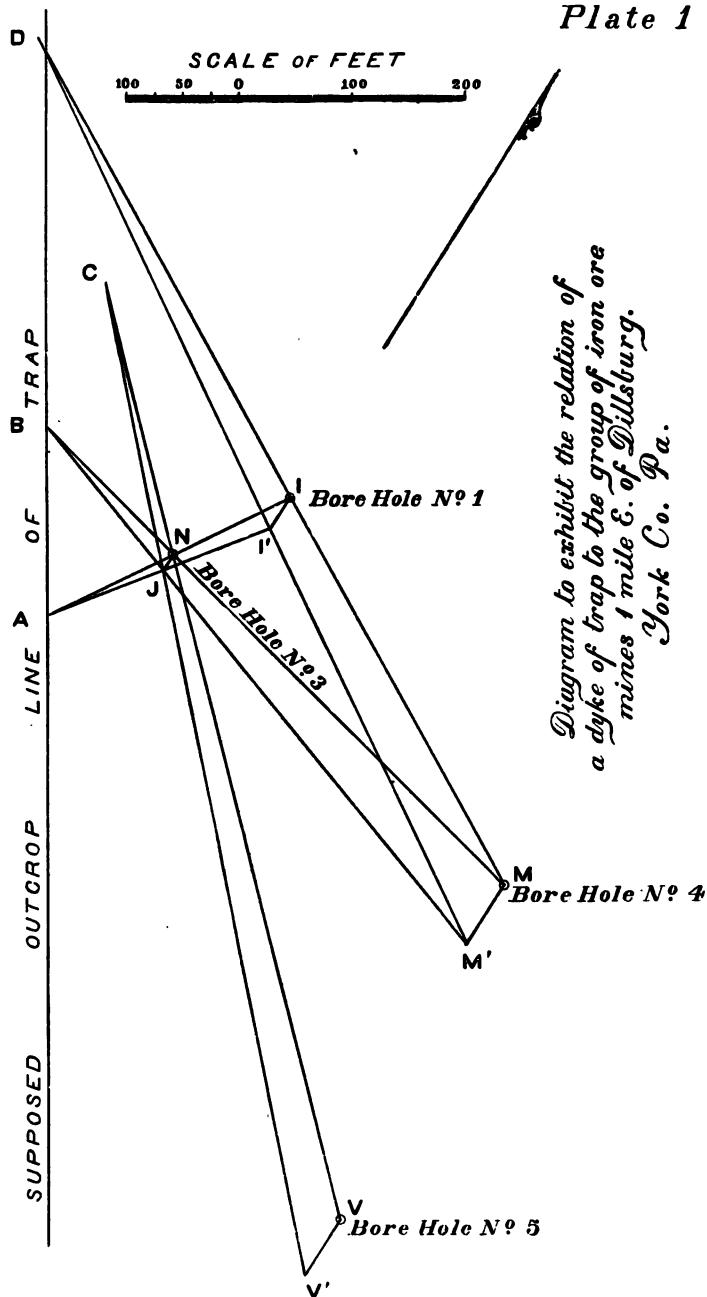


Plate 2.

Fig. 1      Triangles from which points in the line  
of outcrop of trap 1 mile E. of Dillsburg were  
determined.



Fig. 1

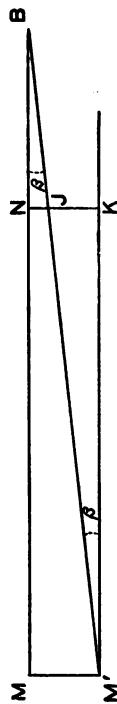


Fig. 2

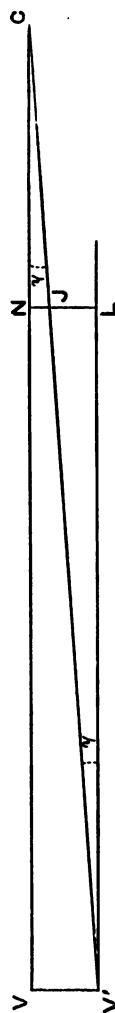


Fig. 3

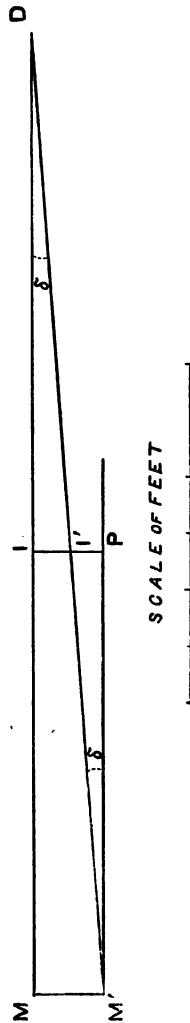
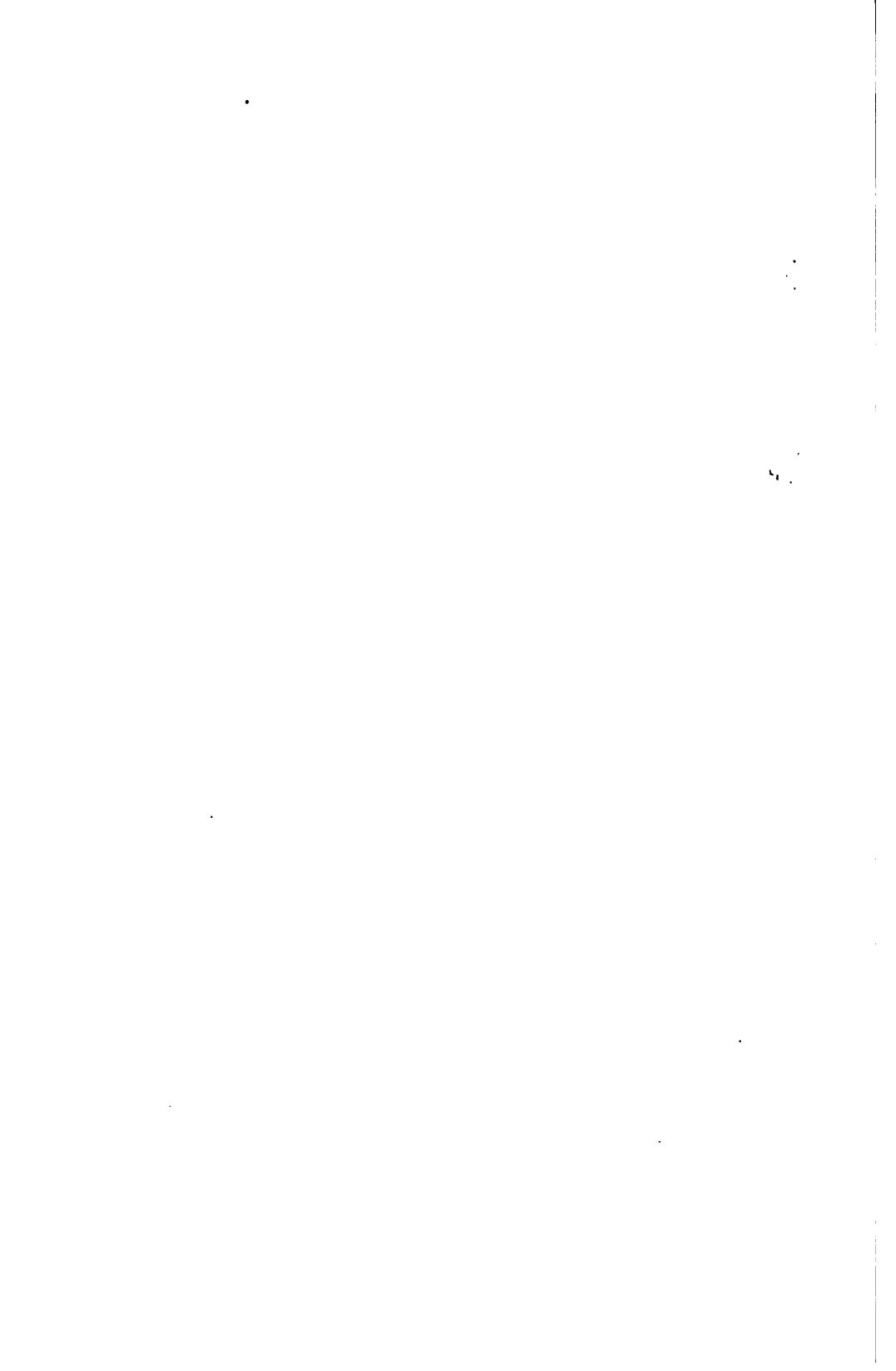


Fig. 4



observed to be continuous, with the normal dip of the country rock, or about  $18^{\circ}$ .

From the records of bore holes 1, 3 and 4, (see pp. 215, 216) and the light thrown upon the structure by the slope from this cut, his plate of trap seems to strike north-eastwardly and to dip gently south-east, conforming, no doubt, to some plane or planes of cleavage, which are frequently met with throughout the entire area of the New Red. This dyke would cross the axis of the open cut at or near its south-western extremity; and this is possibly the reason that an exploitation pit sunk  $\sim$  50 feet from the latter point discovers the ore "pinched at."

From the records of bore holes Nos. 1, 3 and 4, a trap dyke is recorded at a depth of 33 feet, 17 feet and 51 feet from the surface, respectively. This dyke is represented as at least 9 feet thick in No. 1, (with a possible extension downwards of 42 feet, marked "unknown,")  $17\frac{1}{2}$  feet in No. 3 and 16 feet in No. 4.

The positions of bore holes Nos. 1, 3, 4 and 5 can be observed upon the special map of this property. It appears that in No. 1 a mass of trap was struck at 33 feet from the surface and entered for 9 feet. For the next 20 feet no record of the boring was kept.

In No. 3 the trap was struck at 17 feet below the surface, and entirely penetrated the thickness, proving to be  $17\frac{1}{2}$  feet.

In No. 4 trap was encountered at 51 feet below the surface, and proved to be 16 feet 1 inch thick.

In No. 5 a trap was met with 23 feet below the point of starting, at the bottom of the bank, (or 78 feet below the surface,) and is said to be 23 feet 1 inch thick.

There is nothing inconsistent with the idea that these occurrences of trap represent the upper surface of a large dyke from these records of varying thickness. These differences will frequently arise from inaccurate observation, owing to the close resemblance which the altered rock in contact with the dyke bears to the latter, while the exhibition of plates of trap between the regular beds and in the planes of cleavage, and jointing is not rare in the New Red Sandstone. The ascer-

tained thickness of the plate in bore hole No. 3 agrees very well with that in No. 4.

The thickness in No. 1 is not given. Independently of the fact just alluded to that much is called "trap," which is nothing but indurated sediment, the expansion of the bed, (if it be the same,) to 23 feet in bore hole No. 5, is not altogether anomalous.

By assuming, then, that the upper surface of this same bed of trap was met with in bore holes Nos. 1, 3 and 4, at 33 feet, 17 feet and 61 feet\* below a common plane, (the 650 feet contour,) we have the data for calculating the inclination and direction of dip of the bed, and the line of strike on this plane. The latter proves to be N.  $33^{\circ} 30'$  W. It was obtained by calculating the point at which a straight line passing 33 feet below the mouth of 1, and 17 feet below the mouth of 3, would intersect the horizontal plane from which the depths of Nos. 1 and 3 were both reckoned. 2d. Calculating similarly the point on this plane at which the straight line 51 feet below the surface at 4, and 17 feet below the surface at 3 would emerge. 3d. Establishing similarly the intersection of the datum plane by a straight line passing 51 feet below 4, and 33 feet below 1. It is evident that if these three points thus projected fall into the same straight line, the inference is very strong that the three occurrences of trap from which these were independently calculated, are parts of one large surface or approximate plane.

This they very nearly do. The deviation of the last named point being hardly to be avoided owing to the acuteness of the angles made by the lines joining the bore holes and the consequent enormous alteration in the distance which a slight error in the observed angle would cause.

In Plate I, the letters I, N, M and V are chosen to represent the bore holes, I, III, IV and V, respectively, the number of downward strokes in the first three letters corresponding to the number of the bore hole in each case.

(Plate II, Fig. 1). Selecting bore holes, Nos. 1 and 3, (I and N,) we have the distance between them I N=116 feet.

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\*Ten feet must be added to the recorded 51 feet below the surface, because the datum plane of No. 4, (the surface at that point,) is ten feet lower than the surface at Nos. 1 and 3.

$I I'$ =depth from the surface to trap, at No. 1=33 feet,  
 $N J$ =depth from the surface to trap, at No. 3=17 feet:  
 to find the length of the line  $A I$ , or the distance from the  
 mouth of the bore hole No. 1, at which a line passing through  
 it and 3, would intersect the outerop line.

Through  $I'$  draw a line parallel to  $A I$ . (Pl. 2, fig. 1.)

Produce the vertical  $N J$  till it intersect this line  $A' I'$  at  $J'$ .

Let the angle  $A I' A'=\alpha$ .

Let the line  $A I=x$ .

$$\text{Then } \frac{J J'}{I' J'} = \frac{I I' - N J}{I N} = \frac{16}{116} = 0.13791 = \tan \alpha$$

$$\alpha = 7^\circ 51'$$

$$x = 61 \cot \alpha = 239.35 \text{ feet.}$$

In the triangle  $M B M'$  (Plate 2, Fig. 2.)

Let  $x=M B$

$M N = 412 \text{ feet.}$

Let  $\beta=M B M'$

$M M' = 61 \text{ feet.}$

$N J = 17 \text{ feet.}$

$$\tan. \beta = \frac{44}{412} = 0.10679 = \tan. 6^\circ 6'$$

$$x = 61 \cot. \beta = 570.791 \text{ feet.}$$

In the triangle  $V C V'$ . (Plate 2, Fig 3.)

Let  $x=V C$

$V N = 602 \text{ feet.}$

Let  $\gamma=V C V'$

$V V' = 58 \text{ feet.}$

$N J = 17 \text{ feet.}$

$$\text{Then } \tan. \gamma = \frac{41}{602} = 0.068106 = \tan. 3^\circ 54'$$

$$x = 58 \cot. \gamma = 850.77 \text{ feet.}$$

In the triangle  $M D M'$ . (Plate 2, Fig 4.)

Let  $x=M D$

$M I = 390.5$

Let  $\iota=M D M'$

$M M' = 61$

$I I' = 33$

$$\text{Then } \tan. \iota = \frac{28}{291.5} = 0.071702 = \tan. 4^\circ 6'$$

$$x = 61 \cot. \iota = 850.99 \text{ feet.}$$

If we plot these points accurately on the map, and lay off  
 distances corresponding to the calculated lengths of the several  
 perpendiculars of the three triangles, viz:  $I A I'$ ,  $M B M'$ ,  
 $V C V'$ , and  $M D M'$  it will be found that the three points  $A$ ,

B and D fall very nearly in a straight line. But owing to the greater angle which I A and M B make with the outcrop line the points calculated from them are more reliable than the points as calculated from M D M', in which the angles M D M' and M M' D are so small that a very slight error in the experimental data would change the resulting side M D very greatly. Neglecting the point D for the moment, and drawing the line through A B, it is observed that it passes *within five feet* of the point as determined by M D M'. In view of the fact that nature neither pours out trap nor arranges the layers of rock in absolutely geometrical planes, this deviation of 5 feet from the line, due to an excess of 15 feet in a length of 841 feet (or 1.7 per cent) is inconsiderable.

In the triangle V C V' the conditions are yet more unfavorable for accurately determining the position C. The angle between A B and V C is but  $13^{\circ} 25'$  and the angle VV' C is  $86^{\circ} 6'$ , while the rough statements in regard to the bore hole No. 5 render it very difficult to locate the point V' with exactitude. Of course, in a triangle whose hypotenuse and perpendicular make so small an angle, a very slight error in angle will produce a very considerable one in length of side. Owing to these facts (and very probably also to local irregularities in the bed) the point C falls 50 feet short of the outcrop-line, and 212 feet short in a line of 841 feet, showing an error of 25 per cent.

On the other hand the close agreement of the other more favorably constructed triangles lends a strong support to the above supposition as to the location of this bed of trap.

The dip of the bed of trap as calculated by assuming this line of N.  $23^{\circ} 30'$  W. as the correct outcrop on a plane 650 feet above high tide in Philadelphia is given in the following table:

Dip calculated from No. 1.....	E. $23^{\circ} 30'$ N.— $9^{\circ} 29'$
Dip calculated from No. 3.....	E. $23^{\circ} 30'$ N.— $9^{\circ} 39'$
Dip calculated from No. 4.....	E. $23^{\circ} 30'$ N.— $8^{\circ} 1'$
Dip calculated from No. 5.....	E. $23^{\circ} 30'$ N.— $9^{\circ} 39'$
<i>Dip calculated assuming the trap in Logan's shaft to be the same as that in the above bore holes.....</i>	<i><math>2^{\circ} 51'</math></i>

It is evident from this that there are two plates of trap occurring here at a perpendicular distance from each other of

about 15 to 20 feet. The analogies which this structure presents to that of the Cornwall mines will be reserved for a future page. Continuing this assumption as to the identity of these scattered occurrences of trap in one bed, we find that trap should have been met with in the south west slope of M'Cormick & Co.'s long cut at 30 feet below the surface, and in the north-east slope of the same cut, at about 54 feet below the surface.

The first of these statements accords well with the facts.

These slight discrepancies in the calculated dip of the trap are of no importance, and are far within the limits of accuracy of observation.

The outflow of trap probably followed one or more of the planes of cleavage, of which these rocks are full. If this interpretation be correct, the upper surface of the lower dyke would emerge on the surface midway between the south-west end of the long cut and the exploitation pit, still further to the south-west, where the ore was reported to have "pinched out," and if we assume 17 feet as the thickness of the bed and  $9^{\circ} 29'$  as the dip, the breadth of the outcrop would be about 60 feet. This would embrace the entire area of the pit.

It is not clear how far this outcrop extended S.  $23^{\circ} 30'$  E., nor whether its breadth was maintained. If persistent it would pass between Underwood's slope and the old abandoned excavation next north-east of it, and would thus interpose a wall of igneous matter between the Underwood, Smyser, Bell and Grove banks on the one side, and those of M'Cormick & Co., including the Logan shafts and Price's, on the other.

There is nothing in these observations of the thickness inconsistent with the view that they are made on the same dyke, and the probability that Nos. 3 and 4 are so is very strong. Assuming this to be the case, an inspection of the above table will show the average dip to be E.  $23^{\circ} 30'$  N.— $9^{\circ}$  to  $12^{\circ}$ , and projecting its outcrop on the surface, it is found to pass through the small excavation, where no ore was found south-west of the main cut.

It is perhaps owing to this circumstances that the outcrop of the Logan ore is not seen to connect the Underwood slope with some point 100 feet or more south of the Logan shaft, for

if this dyke be continuous in a cleavage plane or other joint in a direction S.  $23^{\circ} 30'$  E. from its supposed outcrop at the M'Cormick cut, it would cut off that portion of the vein between the shaft mouth and the natural line of outcrops of the Logan ore by cutting the vein a short distance west of the former. It follows also that if continuous under the surface, and with the observed gentle dip of  $9^{\circ} 12'$ , it will intersect the Logan slope at a point far below where the trap was observed, viz: at 12 feet below the 340 foot contour line. The record of this Logan shaft is not at hand, but specimens of dolerite were obtained from there, which in mineral constitution (*i. e.*, number and distribution of apatite crystals, etc., etc.,) agreed very closely with similar specimens from the Mumper or M'Cormick & Co.'s cut.

This renders it likely that this outflow of trap along the two planes just mentioned, viz: in the Logan shaft and in the Underwood and M'Cormick mines, was contemporaneous, or at least had the same origin.

The whole ore-deposit of this part of the Dillsburg region seems to be reducible to ; 1st. Deposit of ferruginous matter along the planes of the rocks of the New Red Sandstone, in an irregular manner. 2d. The presence of one large dyke (and probably more) following a plane of cleavage or joint, which had a north-west and south-east strike and a gentle dip. 3d. The alteration of mud-rocks and slates to "traps" (?) of induration and of the more ore less hydrated iron oxides to magnetic and specular ores.

The greenish color of these soft ores when not derived from the oxidation of copper, is due to the commingling of the lower chlorite and hydro-mica slates with the iron ore, and indicates possibly that at least some of this ore was obtained from its depositories in the older slates. But that, even if entirely derived from this source, they have been re-made up in the course of their transfer to the beds of the New Red Sandstone appears to be beyond question.

The observations of Prof. Lesley, Dr. Hunt and others on the great Cornwall iron ore deposit agree in ascribing its existence to several protecting plates of hard trap which have resisted the erosion by which the soft ore, if not thus protected,

would probably have been entirely destroyed. It is not quite clear how much of the magnetic particles with which these ores are mixed may have come from the trap itself. It is likely that much is to be ascribed to this source; but however that may be it cannot but be of the greatest significance that the two plates of trap which occur near these mines enclose or cover the greater number of the producing deposits.

From the description elsewhere given, it will be seen that the King bank, which seems to lie outside of this protecting influence, has a dyke of its own on the eastern (*upper*) side.

The points in favor of the above structure are as follows:

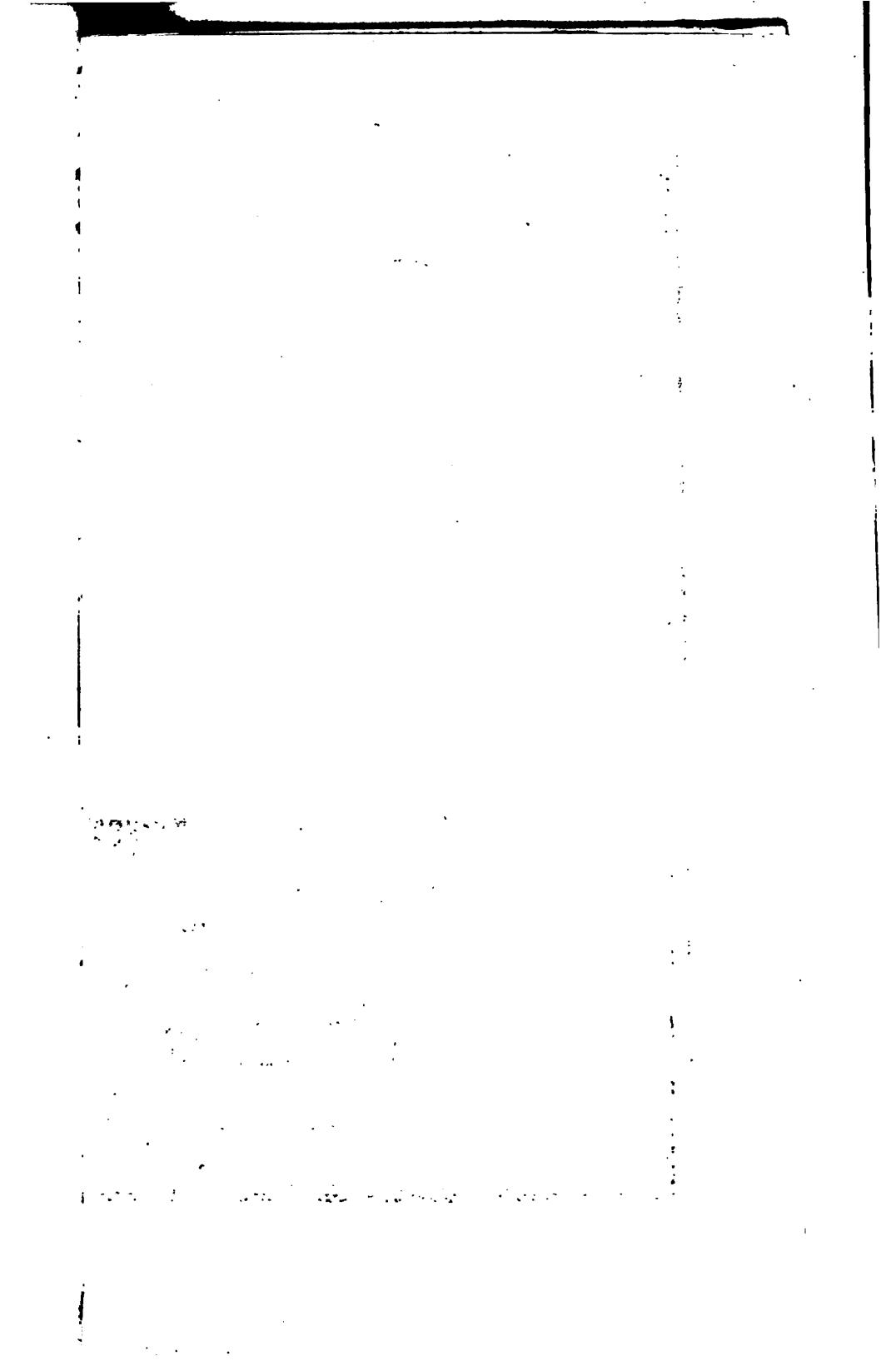
1. The existence of trap in bore holes Nos. 1, 3, 4 and 5, and in M'Cormick's cut, Underwood's slope and Smyser's bank, at points which are very approximately in one plane.
2. The non-occurrence of trap in bore hole No. 2 (though so near to Nos. 1 and 3) because No. 2 is located *below* the edge of the lowermost of these plates of trap.
3. The corroboration of the supposed position of trap in Logan's shaft by the appearance of the topography as seen in the contours. Its supposititious outcrop clearly coincides with the nose of a small hill as it necessarily would do, owing to its superior resistance to erosion.
4. The practically similar thickness of the trap as measured in bore holes 3 and 4.
5. The cutting out of the ore in the pit at the south-west end of M'Cormick & Co.'s long cut.
6. The similarity in the mineralogical constitution and mechanical arrangement of the traps of Logan's shaft, and of the long cut when viewed under the microscope.

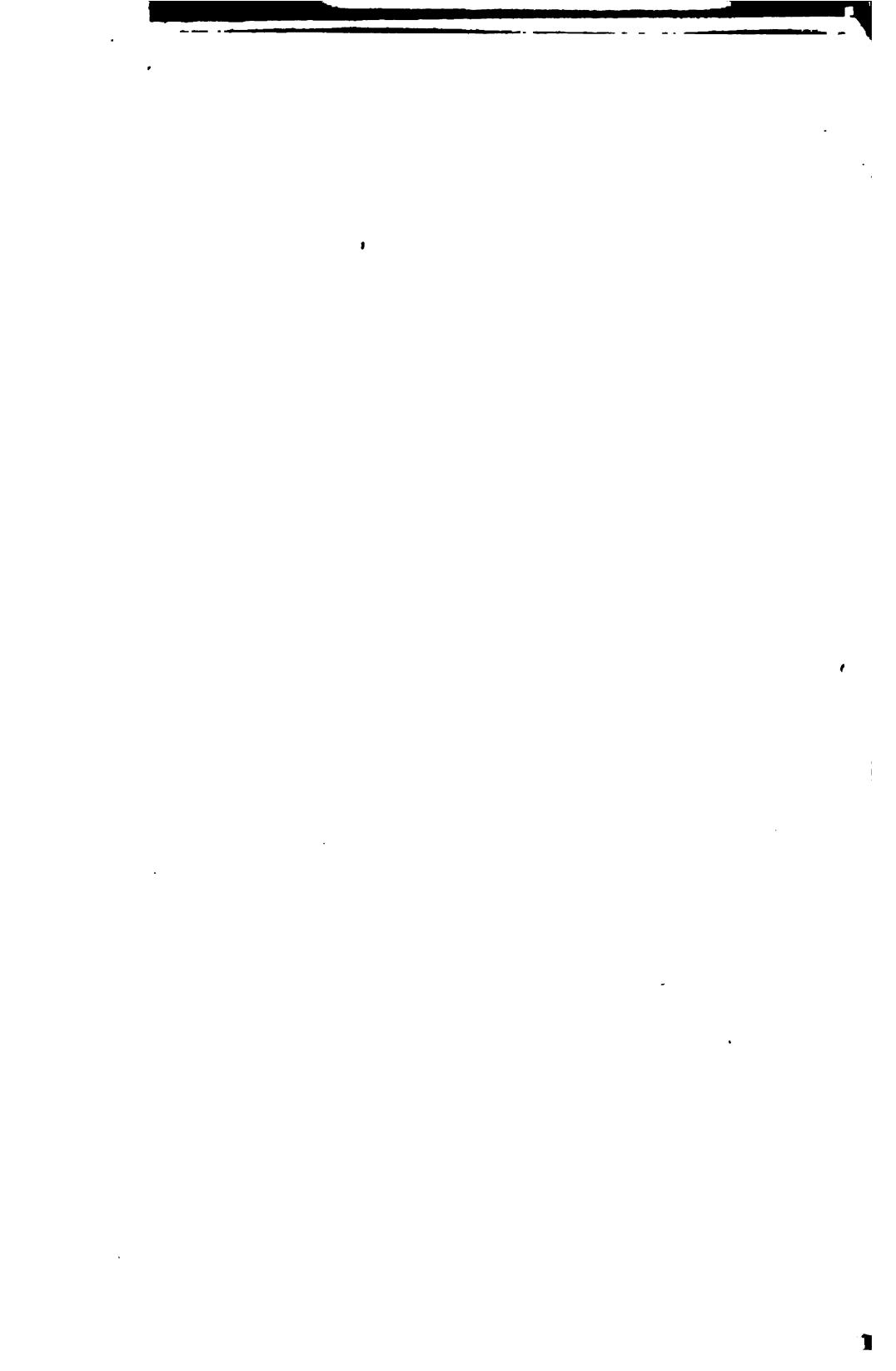
The supposed outcrops of the trap have been drawn in with reference to the 5 feet contours, on the assumption that the tangent of  $9^{\circ} 12'$ , (the assumed average dip of the trap,) or 0.1620 is one-sixth, or in other words, that the ratio of the perpendicular distance apart of the contour lines is to horizontal distance apart of the projections of the trap at those contours :: 1:6. More accurately it is, 1: 6.1.

If these facts be accepted as conclusive as to the structure, the idea of faults bringing up the same bed of ore successively to the surface must be abandoned, unless it be supposed that the dislocations took place before the injection of the molten rock, in which case it must be supposed as a result of the dislocation, that two independent cleavage planes of exactly the same inclination and direction were brought together, so that their two lines of intersection with the opposite walls of the fault agreed exactly.

If, for example, the ore of the Underwood slope be supposed to be brought up to the surface by a fault of which the direction was approximately east and west and the position somewhere between the Underwood slope and M'Cormick & Co.'s cut ; the agreement of the upper surface of the trap in the former with the position of the dyke in the latter must be considered either entirely fortuitous, or it must be assumed that a cleavage plane south of this fault formed a geometrical continuation to that one north of the fault through which the molten rock was poured out, a supposition which is in the highest degree improbable.

But independently of the difficulty in accounting for a continuous bed of trap dipping at an uniform angle and spreading over an extensive area, while there were within its limits numerous faults and up- or down-throws ; the number of places where micaceous ore is found renders this fault hypothesis unnecessary. The coating of specular oxide of iron which is sometimes so thick as to be a most valuable ore, is also sometimes so thin as to be barely visible ; and between these extremes it occurs in all quantities and over every amount of space. A few localities where this ore was observed may be here mentioned. Half amile south of Dillsburg, near the fork of the new York and Carlisle road, a small outcrop of ore was observed crossing both roads. This small bed can scarcely be related to the Mumper-Underwood deposits, of which the strike would cut the road much further to the north ; nor can it be identified with the Grove and Price ores, because there the general dip is N.  $10^{\circ}$  E., which would, if maintained, again swing their outerops too far to the north.





One and one-half miles south-east of the fork of the new York and Rossville roads, Mr. Deardorf has sunk a shaft about 57 feet, (according to Mr. Altland,) in the course of which he passed through several seams of micaceous ore.

One and one-half miles W. by N. of Rossville, Mr. D. Altland sank a shaft and passed through 6 inches of micaceous ore ten feet below the surface and close to the trap.

Mr. Altland reports having found scattered deposits of micaceous ore one-half mile north-west of Wellsville post office, and also one and one-half miles west by south of Wellsville post office, at the intersection of two roads.

Mr. Altland reports having found the strike of the Mine Bank ore, and proved it for a considerable distance N. E. and S. W.

A ridge running N. E. and S. W. nearly parallel to a line joining Wellsville and Rossville, and distant from such a line about one-half mile S. E., rocks have been found by Mr. Altland coated with micaceous ore. In Monaghan township, Mr. Altland reports having found micaceous ore on the farms of L. Cannon and E. Ellicker, but my party was not able to verify this observation.

The same authority may be given for the localities  $1\frac{1}{2}$  miles south-west of Franklintown, on S. Filler's farm, and at B. Meyers', all in Franklin township. (The latter observation was verified).

Another locality referred to by Mr. Altland is two miles south-east of Dillsburg, on the property of Mr. J. Cook, where a shaft is said to have been opened in 1874 for seven feet, out of which was taken some micaceous ore in a very much weathered rock.

On Mr. M'Ilwee's farm Mr. Altland sank a shaft 46 feet deep, and reports passing through sandstone coated with quartz, and 1 inch of micaceous ore. This locality which lies about  $1\frac{1}{2}$  miles north-east of Mount Top P. O., was visited and was found to be sunk in sandstone dipping about north-west. The shaft is at present about 30 feet deep. A similar exposure is found on the property of Michael Bentz about one-half mile from here.

Adhesive clay is reported 46 feet down above the trap and 3 feet thick.

On David Bentz's farm, two miles east of Dillsburg, trial shafts were sunk and some micaceous ore was found.

On the Lewisberry road, north of its junction with the York road, Mr. Altland found numerous specimens in place coated with micaceous ore.

About one-half mile east of Cannon's is a shaft of Peter A. Meyer's about 12 feet deep. The rock thrown out is a stained sandstone, with some little micaceous ore. Some small specimens found one-half inch thick.

Instances of the occurrence of micaceous ore in these and similar rocks of the Mesozoic sandstones might be multiplied almost indefinitely.

It is an important fact, however, that almost all, if not all, these localities are situated *on the western side of the "New Red"* from the Susquehanna to the Maryland line.

Now these localities where more or less micaceous ore has been observed are selected at random, from notes, on an area of scores of square miles in extent. Some of the surfaces of rock on which this ore was observed dipped in the normal direction or the bed plates of the Mesozoic sandstone of Middle Pennsylvania; and some in very contrary directions and with very different degrees of steepness. That is to say that some of this ore was deposited along the planes of bedding, and much of it along different planes of cleavage.

This of itself shows a very general distribution of the material, (though in but few localities has it as yet been proved to exist in paying quantities,) and where one thick deposit is found others are likely to be found near it.

It seems, then, unnecessary to seek to account for the presence of two beds of micaceous ore situated near each other by assuming a repetition of the same bed by an upthrow, even were other facts such as have been mentioned as existing in the Dillsburg region not opposed to such an hypothesis.

The quantity of micaceous ore massed together in one deposit depends upon causes entirely unknown. All degrees of quantity can be observed, from the solid mass of glistening black ore, three or four feet thick, to the faint glimmer of the crystalline scales only observable under a powerful magnifying glass. One thing deserves to be mentioned which seems to

show that in whatsoever way the micaceous ore first appeared, it was an incident to the rock making of the geological Middle-Age or subsequent to it. A large number of specimens of sand-stone, coated more or less completely with micaceous ore, were broken and examined, and in no case was ore found in the interior of a solid specimen. In some cases, indeed, flakes of the ore parallel to those on the outside were discovered, but this was invariably when the manner of fracturing of the rock rendered it likely that this deposit was in an obscure bed plane.

From this fact, then, it would appear that whether the particles of magnetite from the adjoining traps were *oxidized\** or *hydroxidized* and carried over between planes of bedding and cleavage, or whether the limonites of the older formations were stirred up and spread over these planes, to be afterwards deprived of their water by heat; or whether chalybeate waters left such a deposit, (there must have been an enormous quantity of iron used in giving this formation its red color,) the beds and cleavage planes were there when the iron came to them, and as this must have been an action extending over a vast territory, it is as much to the purpose to seek why iron ore is *not* in any given locality as to attempt to simplify the problem by making a broken bed do double duty, unless there appear strong evidence in favor of the existence of faults.

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\* Many chemists doubt the wholesale decomposition of magnetic oxide of iron (its most stable compound) into the less stable forms of limonite and hematite.

**CHAPTER XIV.**  
**CATALOGUE of specimens collected during the field work of 1875 in York, Adams and Franklin Counties.**

Prov'sl field num- ber of spec- imen.	Character.	Locality.	Remarks.
370.....	Trap.....	800 feet north-west of summit of Little Round-Top. North side of Devil's Den.	*On Government map marked A
371.....	Trap.....	West slope of Round-Top.	On Government map marked B
372.....	Trap.....	Vincent's Spur.	On Government map marked C
373.....	Trap.....	Near Cassall's, Taneytown road.	On Government map marked D
374.....	Trap.....	East face of Culp's Hill.	On Government map marked E
375.....	Trap.....	100 yards south of Rock creek bridge, 600 yards south of Rock creek bridge, Half a mile south of Rock creek bridge— east bank.	On Government map marked F
376.....	Indurated mud rock.....	Wolf's Hill, $\frac{1}{4}$ mile from M'Allister's Crossing of Seminary Ridge by Springs road.	On Government map marked G
377.....	Indurated mud rock.....	Loose boulder, part of breastworks, Underlying trap in first cut Tape Worm railroad, north-west of Gettysburg.	On Government map marked H
378.....	Trap.....	Cut of Tape Worm railroad, north-west of Gettysburg.	On Government map marked I
379.....	Trap (dolerite).....	Cut of Tape Worm railroad, north-west of Gettysburg.	On Government map marked J
380.....	Shales.....	Cut of Tape Worm railroad, north-west of Gettysburg.	On Government map marked K
381.....	Trap.....	Cut of Tape Worm railroad, north-west of Gettysburg.	On Government map marked L
382.....	Trap.....	Underlying trap in first cut Tape Worm railroad, north-west of Gettysburg.	On Government map marked M
383.....	Shales.....	Shaft, Underwood's Mine.	Marked on Government map N
384.....	Altered sandstone, weathered.....	Shaft, Underwood's Mine.	
385.....	Indurated mud rock.....	Shaft, Underwood's Mine.	
386.....	Magnetic ore and pyrite.....	Mine, Dillsburg, York county.	
387.....	Green shaly sandstone.....		
388.....	Green shaly sandstone.....		

\* The very detailed and accurate map of the Gettysburg battle field in contour lines made by the officers of the U. S. army, was used for the purpose of locating geological features. The data thus obtained will be transferred to maps illustrating my report.

389 . . . . .	Very hard pink sandstone.....	Sandstone heap outside of Underwood's Mine.
390 . . . . .	Green sandstone.....	Underwood's new opening.
391 . . . . .	Dolomite surface rock.....	Underwood's open bank.
392 . . . . .	Greenish limestone occurring in the ore.	Same mine, Underwood's.
393 . . . . .	Greenish limestone, bottom rock.....	Same mine, Underwood's.
394 . . . . .	Greenish chloritic sandstone.....	Heap outside of Underwood's mine.
395 . . . . .	Garnets in green sandstone.....	Heap outside of Underwood's mine.
396 . . . . .	Magnetic ore.....	Underwood's new opening.
397 . . . . .	Trap. Top rock .....	Underwood's new opening.
398 . . . . .	Altered sandstone.....	Underwood's mine.
399 . . . . .	Decomposed rock occurring in the crevices.....	Underwood's mine.
400 . . . . .	Magnetic ore .....	Shaft, McCormick & Co.'s mine, Dillsburg, York county.
401 . . . . .	Magnetic ore with pyrite .....	Shaft, McCormick & Co.'s mine, Dillsburg, York county.
402 . . . . .	Magnetic ore with pyrite .....	Shaft, McCormick & Co.'s mine, Dillsburg, York county.
403 . . . . .	Chlorite rock .....	McCormick & Co.'s "long cut."
404 . . . . .	Sandstone, top rock.....	McCormick & Co.'s mine, "long cut."
405 . . . . .	Trap. Top rock .....	McCormick & Co.'s mine proper, "Long cut,"
406 . . . . .	Limestone, foot rock .....	McCormick & Co.'s shaft.
407 . . . . .	Top rock, chlorite rock.....	MacWilliams' mine, Bell's farm, Dillsburg, York county.
408 . . . . .	Magnetic ore .....	MacWilliams' mine, Bell's farm, Dillsburg, York county.
409 . . . . .	Chlorite rock .....	MacWilliams' mine, Bell's farm, Dillsburg, York county.
410 . . . . .	Mud-rock ; top rock .....	MacWilliams' mine, Bell's farm, Dillsburg, York county.
411 . . . . .	Magnetic ore .....	Grove's mine, 2 miles north-east of Dillsburg road to York.
412 . . . . .	Altered sandstone; top rock .....	Grove's mine.
413 . . . . .	Magnetic ore .....	Fuller's mine, Landis' farm, Yellow Breeches creek.
414 . . . . .	Micaeous ore.....	Fuller's mine.
415 . . . . .	Decomposed trap (?) ; top rock .....	Fuller's mine.
416 . . . . .	Limestone; bottom rock.....	Fuller's mine.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spec- imen.	Character.	Locality.	Remarks.
417.....	Altered sandstone (?) containing ore .....	Landis' farm.	
418.....	Limestone.....	Railroad cut near Dillsburg.	York co.
419.....	Trap.....	Railroad cut; occurs next to limestone	
420.....	Trap.....	above.	
421.....	Limestone conglomerate (Mesozoic) con- taining rounded pebbles of older lime- stone .....	Railroad cut near Dillsburg.	
422.....	Limestone conglomerate .....	Kuntz's farm, near Dillsburg.	
423.....	Limestone.....	Pit one-half mile south-west of Dills- burg.	
424.....	Mesozoic limestone (marl?) .....	Mill dam, Müller's Mill, near Dillsburg.	
425.....	"Marl" (?) ; Mesozoic limestone con- glomerate.....	Weitz's farm, Dillsburg.	
426.....	Limestone, Mesozoic .....	Weitz's farm, Dillsburg.	
427.....	Mesozoic .....	Railroad cut near Dillsburg.	
428.....	Sandstone .....	Weitz's farm, Dillsburg.	
429.....	Red sandstone .....	On hill near Carlisle road, three-fourths	
430.....	Orthofelsite (?) .....	of a mile north of Dillsburg.	
431.....	Sandstone .....	Road opposite McCormick's "long out."	
432.....	Grayish-pink sandstone .....	Two and a half miles north-east of	
433.....	Quartzite and sandstone .....	Dillsburg.	
434.....	Trap.....	Harrisburg road, one-half mile north- east of Dillsburg.	
		One-half mile east of Dillsburg on road	
		to mines.	
		Foot of South mountain, three-fourths of	
		a mile north-west of Dillsburg.	
		Round Top, Warrington township, York	
		county.	

435.....	Decomposed trap .....	Round Top.
436.....	Decomposed trap ; top rock .....	Shelly's bank, Cumberland county.
437.....	Trap of alteration (?) .....	Railroad cut near Dillsburg.
438.....	Trap.....	One-half mile north-west of Dillsburg, on hill.
439.....	Trap of alteration (?) .....	On Harrisburg road, one-half mile north-east of Dillsburg.
440.....	Decomposing trap.....	One-half mile south-west of Dillsburg.
441.....	Gray sandstone.....	Harrisburg road, one-half mile north-east of Dillsburg.
442.....	Trap .....	Lerew's farm, one-fourth of a mile south of Dillsburg.
443.....	Trap .....	O.Hale's school house road, 1½ miles east of Dillsburg.
444.....	Mesozoic sandstone .....	Logan's diggings, 1½ miles east of Dillsburg.
445.....	Lilac sandstone .....	Near O. Hale's school house, two miles east of Dillsburg.
446.....	Porphyritic trap .....	John Myers' farm, 3½ miles east of Dillsburg.
447.....	Red sandstone .....	M. Porter's farm, one-half mile south-west of Dillsburg.
448.....	Trap.....	M. Porter's farm, in field on hill, Gettysburg road.
449.....	Trap.....	C. Bender's farm, Gettysburg road, 1½ miles south-west of Dillsburg.
450.....	Trap.....	M. Porter's farm, Gettysburg road, ½ mile south-west of Dillsburg.
451.....	Quartzite .....	"White Rock," South mountain, Cambrian county.
452.....	Trap.....	M'Clure's farm, 4 miles south-east of Dillsburg.
453.....	Asbestus and ore.	M'Elwee's farm, 4 miles south-east of Dillsburg.
454.....	Sandstone.	M'Elwee's farm.
455.....	Sandstone, with coating crystalline quartz.	M'Elwee's farm.
456.....	Trap.	M'Cornick's mine, 1 mile east of Dillsburg.
457.....	Magnetite, micaeous ore and asbestos.	M'Elwee's farm.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov's'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
458.....	Asbestus in Feldspar	M'Elwee's farm.	
459.....	Conglomerate, micaceous ore and asbestus.	M'Elwee's farm.	
460.....	Trap.....	M'Elwee's farm, from shaft.	
461.....	Decomposed trap.....	J. Crowell's house, 6 miles south-east of Dillsburg.	
462.....	Sandstone coated with micaceous ore .....	G. Ellicker's farm, 5 miles east of Dillsburg.	
463.....	Sandstone and iron oxide.	Cookson's farm, 2 miles east of Dillsburg.	
464.....	Magnetic and micaceous ore and limonite	Price & Hancock's mine, 2 miles east of Dillsburg.	
465.....	Magnetic ore .....	Rossville, $\frac{1}{4}$ miles east of Mt. Top P. O.	
466.....	Magnetic ore and red oxide .....	M. Wiley's farm, $2\frac{1}{2}$ miles from Mt. Top P. O.	
467.....	Magnetic ore .....	E. F. Cookson's, 8 miles east of Dillsburg.	
468.....	Sandstone carrying micaceous ore .....	Peter H. Myers', 5 miles east of Dillsburg.	
469.....	Sandstone carrying micaceous ore .....	Wellsville road to "Black" (Blue) Ridge.	
470.....	Sandstone hardened by contact with trap.	Three-fourths of a mile south-east of Wellsville.	
471.....	Trap.....	S. Marsh's farm, 1 $\frac{1}{4}$ miles south-east of Wellsville.	
472.....	Decomposed trap.....	Hartman's farm, 1 mile north-west of Wellsville,	
473.....	Quartz crystals in syenite .....		

474.....	Sandstone coated micaeous ore.....	D. Cadwalader's, $1\frac{1}{4}$ miles west of Wellsville.
475.....	Decomposed ferruginous rock, with chlorite.	Buschey's farm, $1\frac{1}{4}$ miles west of Wellsville.
476.....	Dolerite .....	S. Marsh's farm, $1\frac{1}{4}$ miles south-east of Wellsville.
477.....	Compact porphyritic syenite .....	Harran's farm, 1 mile north-west of Wellsville.
478.....	Coarse porphyritic syenite .....	Harran's blacksmith shop.
479.....	Asbestos.....	S. Marsh's farm, $1\frac{1}{2}$ miles south-east of Wellsville.
480.....	Decomposed ferruginous trap .....	D. Altland's, $1\frac{1}{4}$ miles west of Wellsville.
481.....	Mud rock.....	On top of Blue Ridge. Extends south of Rossville and Wellsville.
482.....	Micaeous ore.....	W. R. Smith's farm, 3 miles east of Hall P. O.
483.....	Weathered trap .....	D. Cadwalader's $1\frac{1}{4}$ miles west of Wellsville.
484.....	Argillaceous greenish sandrock .....	Blue ridge.
485.....	Weathered trap .....	W. R. Smith's.
486.....	Magnetic float ore .....	S. Marsh's farm, $1\frac{1}{4}$ miles south-east of Wellsville.
487.....	Feldspathic trap .....	M. Porter's farm, $\frac{1}{2}$ mile south-west of Dillsburg.
488.....	Light colored argillaceous sandstone .....	H. Heiges' 3 miles south-west of Dillsburg.
489.....	Hematite ochre and black glassy ore .....	Lerew's farm, $\frac{1}{2}$ mile north-east of Lerew's tavern.
490.....	Trap.....	M. Porter's farm, $\frac{1}{2}$ mile south-west of Dillsburg, Gettysburg road.
491.....	Wash ore .....	H. Heiges' corn-field, 3 miles south-west of Dillsburg.
492.....	Conglomerate sand rock.....	H. Heiges' farm.
493.....	Concretionary limonite.....	Wolf's farm, 3 miles south-west of Dillsburg.
494.....	Trap.....	M. Porter's farm, $\frac{1}{2}$ mile south-west of Dillsburg.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
495.....	Coating on hard trap .....	M'Melwee's farm, 4 miles south-east of Dillsburg.	
496.....	Asbestos .....	M'Melwee's farm.	
497.....	Trap .....	M'Melwee's farm.	
498.....	Contact of fine and coarse-grained trap .....	M'Melwee's.	
499.....	Ferruginous conglomerate, with mica- eons ore .....	M'Melwee's.	
500.....	Sandstone with surface of quartz pebbles .....	M'Melwee's farm, 4 miles south-east of Dillsburg.	
501.....	Impure hematite ore.....	Christian Bender's, 2 miles south-west of Dillsburg.	
502.....	Impure iron ore, mixed with copper .....	Lichter's bank, 10 miles south-west of Dillsburg.	
503.....	Earthy sandstone .....	Price's farm, 2 miles south-east of Dillsburg.	
504.....	Sandstone .....	S. Filler's, 2 miles south-west of Dillsburg.	
505.....	Ferruginous greenish sandstone .....	Price's farm, 2 miles south-east of Dillsburg.	
506.....	Mesozoic sandstone.....	Adams county line on road to Dillsburg, near Briggstown.	
507.....	Limestone .....	Old quarry on Brennan's farm.	
508.....	Micaceous ore and copper .....	J. T. Smith's, 3 miles south of Wells- ville.	
509.....	Reddish-green sandstone.....	C. Bender's farm, 2 miles south-west of Dillsburg.	
510.....	Dirt containing ore.....	Geo. Heiges', 3½ miles south-west of Dillsburg.	

511.....	Surface ore.....	Jno. Lehmer's 1½ miles north-east of Franklintown.
512.....	Mesozoic sandstone.....	Mill dam, 3 miles south of Franklin-town.
513.....	Mesozoic sandstone.....	From shaft on Geo. Heiges' farm, 3 miles south-west of Dillsburg.
514.....	Stained sandstone.....	Grove's farm, 2 miles south-east of Dillsburg.
515.....	Hematite ore (not magnetic) .....	M'Cormick & Co.'s mine, 1½ miles south-west of Dillsburg.
516.....	Scoriaceous sandstone and micaceous ore	Nickey's, 3 miles south of Wellsville.
517.....	Sandstone and micaceous ore .....	J. T. Smith's 3 miles south of Wellsville.
518.....	Red sandstone spotted with green on	One mile south of Franklintown.
519.....	fresh fracture.....	Jno. Lehmer's, ¼ mile north-east of Franklintown.
520.....	Decomposed sandstone with particles	H. Bender's, 1½ miles south-west of
	magnetite.	Dillsburg.
	Mesozoic sandstone from old lime kiln ..	C. Bender's, 1½ miles south-west of Dillsburg.
521.....	White sandstone .....	Geo. Heiges', 3 miles south-west of Dillsburg.
522.....	Decomposed coarse-grained trap .....	Geo. Heiges', 3 miles south-west of Dillsburg.
523.....	Coarse-grained trap.....	Geo. Heiges', 3½ miles south-west of Dillsburg.
524.....	Porphyritic trap .....	Old Berlin road, 9 miles south-west of Dillsburg.
525.....	Argillaceous greenish sandstone .....	Geo. Heiges', 3½ miles south-west of Dillsburg.
526.....	Micaceous ore in yellow sandstone .....	Jacob B. Smith's, 3 miles south of Wells-ville.
527.....	Mesozoic sandstone.....	Adams county line, near Braggtown, road to Dillsburg, 9 miles south-west of Dillsburg.
528.....	Mesozoic sandstone.....	One mile south-east of Braggtown, (Adams).
529.....	Decomposed coarse syenite.....	H. Heiges', 2½ miles south-west of Dillsburg.
530.....	Coarse conglomerate limestone .....	Brennan's old quarry, 1½ miles south-west of Dillsburg.
		Porphyritic and very ferruginous. Green from contained chlorite schists.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
531.....	Micaceous ore .....	J. T. Smith's, 3 miles south of Wells-ville.	
532.....	Clay lumps with limonite .....	One mile north of Mt. Top P. O. Presented by Mr. Altland.	
533.....	Coarse Mesozoic sandstone .....	C. Bender's, 1½ miles south-west of Dillsburg.	
534.....	Outcrop hematite ore .....	C. Bender's, 1½ miles south-west of Dillsburg.	
535.....	Hard altered sandstone .....	Grove's farm, 1½ miles south-east of Dillsburg.	
536.....	Coarser-grained granitic syenite.....	Harman's, 1 mile west of Wellsville.	
537.....	Coarse felspathic syenite .....	A. Heiges', 3½ miles south-west of Dillsburg.	Much weathered.
538.....	Greenish shale .....	Mill dam, 3½ miles south of Franklin-town.	
539.....	Coarse conglomerate sandstone carrying ore .....	Price's, 2 miles south-east of Dillsburg.	Carrying green schist fragments.
540.....	Limestone.....	H. Bender's, 1½ miles south-west of Dillsburg.	
541.....	Arenaceous limonite .....	J. Lichle's, 3 miles north-west of Davidsburg.	
542.....	Mesozoic sandstone .....	One-fourth of a mile north of Franklin-town.	
543.....	Mesozoic shale.....	One mile north-east of Braggtown.	
544.....	Sandstone with spots of iron oxide.....	C. Bender's, 1½ miles south-west of Dillsburg.	Carrying the ore.
545.....	Ferruginous coarse-grained trap .....	Geo. Heiges', 3½ miles south-west of Dillsburg.	Much weathered.

546.....	Weathered trap .....	Geo. Heiges', $3\frac{1}{2}$ miles south-west of Dillsburg.	Containing micaeous iron in small plates.
547.....	Mud rock,.....	J. T. Smith's, 3 miles south of Wells-ville.	
548.....	Dolerite .....	J. Lichie's, 3 miles north-west of Dillsburg.	
549.....	Mesozoic sandstone coated with copper ..	Lehmer's, $\frac{1}{2}$ mile north-east of Franklinton.	Pinkish green in fresh fracture.
550.....	Syenitic granite .....	S. Heiges', $3\frac{1}{2}$ miles south-west of Dillsburg.	
551.....	Clay shales accompanying hematite .....	Ch. Hender's, $1\frac{1}{2}$ miles south-west of Dillsburg.	
552.....	Mesozoic sandstone .....	J. T. Smith's, 3 miles south of Wells-ville.	
553.....	Red sandstone .....	One mile south of Franklinton.	
554.....	Trap .....	Geo. Heiges', $3\frac{1}{2}$ miles south-west of Dillsburg.	Much weathered.
555.....	Coarse-grained syenitic granite (?) .....	Geo. Heiges', $3\frac{1}{2}$ miles south-west of Dillsburg.	Dark reddish brown color.
556.....	Coarse-grained syenitic granite (?) .....	A. Heiges', $3\frac{1}{2}$ miles south-west of Dillsburg.	
557.....	Sandstone .....	M. Ellicker's, 5 miles east of Dillsburg, south of Mt. Pleasant.	
558.....	Sandstone, with some ore .....	M. Ellicker's farm, 5 miles east of Dillsburg.	
559.....	Purple mud rock .....	Adams county line, 9 miles south-west of Dillsburg.	
560.....	Mesozoic sandstone .....	One-half mile south of Frankintown.	
561.....	Blood red sandstone .....	Three miles south of Dillsburg.	
562.....	Light red sandstone .....	Three and one-half miles south of Dillsburg.	
563.....	Felspathic syenite .....	Nine miles south-west of Dillsburg.	Very large feldspar crystals.
564.....	Coarse-grained sandstone .....	P. A. Myers' 5 miles east of Dillsburg.	Spangles of micaeous iron ore.
565.....	Argillaceous sandstone .....	Three and one-half miles south-west of Dillsburg.	
566.....	Hard sandstone .....	Three and one-half miles south-west of Dillsburg.	
568.....	Dolerite .....	E. Hoffman's, 6 miles east of Dillsburg.	
567.....	Argillaceous sandstone .....	One mile south-east of Braggtown.	

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
569.....	Sandstone and coating of micaceous ore.....	M. Eicker's, 5 miles east of Dillsburg.	
570.....	Argillaceous sandstone.....	Jno. Lehner's, $\frac{1}{2}$ mile north-east of Franklintown.	
571.....	Red sandstone .....	Bernudian creek, 8 miles south-west of Dillsburg.	
572.....	Trap of alteration .....	S. Heiges', $\frac{3}{4}$ miles south-west of Dillsburg.	
573.....	Red sandstone .....	P. Burkhardt's, 3 miles south of Dillsburg.	
574.....	Mesozoic sandstone .....	Three miles south of Dillsburg.	
575.....	Trap (of alteration?) .....	Old Berlin road, 9 miles south-west of Dillsburg.	
576.....	Red and blue shale .....	E. Hoffman's, 6 miles east of Dillsburg.	
577.....	Syenitic granite.....	E. Hoffman's, 6 miles east of Dillsburg.	
578.....	Hard baked blue mud rock.....	Old Berlin road, 9 miles south-west of Dillsburg.	
579.....	Dark purple argillaceous sandstone.....	Levi Cannon's, $\frac{4}{5}$ miles east of Dillsburg.	
580.....	Mesozoic shale .....	Mill dam, $\frac{3}{4}$ miles south-east of Franklinton.	
581.....	Trap.....	Levi Cannon's, $4\frac{1}{2}$ miles east of Dillsburg.	
582.....	Trap of alteration (?) .....	Levi Cannon's, $4\frac{1}{2}$ miles east of Dillsburg.	
583.....	Mesozoic sandstone .....	Levi Cannon's, $4\frac{1}{2}$ miles east of Dillsburg.	
584.....	Coarse-grained sandstone pitted with iron oxide.	Jno. Kimmel's, 5 miles east of Dillsburg.	

585.....	Syenitic granite.....	Levi Cannon's, $4\frac{1}{2}$ miles east of Dillsburg.
586.....	Hard blue mud rock.....	P. A. Myer's, 5 miles east of Dillsburg.
587.....	Coarse yellow and green sandstone.....	Cross-roads, sign post 5 miles to Lewisberry, and 5 miles east of Dillsburg.
588.....	Greenish sandstone carrying ore.....	Jno. Lehmer's, $\frac{1}{2}$ mile north-east of Franklinstown.
589.....	Light bluish mud rock.....	Nine miles south-west of Dillsburg.
590.....	Trap.....	E. Hoffman's, 5 miles east of Dillsburg.
591.....	Coarse greenish sandstone, with coating of milaceous ore.....	P. A. Myer's, 5 miles east of Dillsburg. S. Heiges, $\frac{3}{4}$ miles south-west of Dillsburg.
592.....	Conglomerate (?).....	Nine miles south-west of Dillsburg.
593.....	Coarse-grained trap.....	E. Hoffman's, 5 miles east of Dillsburg.
594.....	Trap.....	M. Elicker's, 5 miles east of Dillsburg.
595.....	Asbestus.....	M. Elicker's, 5 miles east of Dillsburg.
596.....	Green sandstone carrying magnetic ore.....	M. Elicker's, 1 $\frac{1}{2}$ miles east of Wells-
597.....	Trap.....	Ville.
598.....	Coarse sandstone carrying magnetic ore.....	Morgenthaler's, 1 $\frac{1}{2}$ miles north of Wells-
599.....	Magnetic ore.....	Ville.
600.....	Coarse pink sandstone.....	Morgenthaler's, north of Wellsville.
601.....	Green sandstone.....	Morgenthaler's, 1 $\frac{1}{2}$ miles north of Wellsville.
602.....	Magnetic ore.....	M. Wiley's farm shaft.
603.....	Bluish mud rock.....	M. Wiley's farm, from field 1 mile east by north of Wellsville.
604.....	Argillaceous bluish sandstone.....	M. Wiley's farm, north of Wellsville.
605.....	Magnetic float ore.....	M. Wiley's, north of Wellsville.
606.....	Yellow clay.....	Morgenthaler's, 1 $\frac{1}{2}$ miles north of Wellsville.
637.....	Trap (weathered).....	Franklintown road, 1 $\frac{1}{2}$ miles north-east of Rossville.
638.....	Trap.....	Franklintown road, 1 $\frac{1}{4}$ miles north-east of Rossville.
609.....	Purplish argillaceous sandstone.....	One-half mile north-west of Wellsville.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
610. ....	Argillaceous red sandstone with green spots.	J. Griest's farm, $\frac{1}{2}$ mile north-west of Wellsville.	
611. ....	Clay.....	J. Griest's, $\frac{1}{2}$ mile north-west of Wellsville.	
612. ....	Argillaceous blue sandstone with bright red coating.	J. Griest's farm, $\frac{1}{2}$ miles north-west of Wellsville.	
613. ....	Coarse-grained trap.....	Two miles north-west of Wellsville.	
614. ....	Very coarse syenitic granite, with bunch of asbestos.	Harman's, 2 miles north-west of Wellsville.	
615. ....	Trap.....	One-half mile north-west of Wellsville.	
616. ....	Coarse grayish sandstone.....	One-half mile north-west of Wellsville.	
617. ....	Reddish mud-rock.....	Three-fourths of a mile north-west of Wellsville.	
618. ....	Arenaceous purple mud-rock.....	One-half mile north-west of Wellsville.	
619. ....	Red mud-rock with green spots.....	One-half mile north-west of Wellsville.	
620. ....	Hard blue mud rock.....	One-half mile north-west of Wellsville.	
621. ....	Argillaceous lamellar variegated sandstone.	Three-fourths of a mile north-west of Wellsville.	
622. ....	Mesozoic sandstone.....	Three-fourths of a mile north-west of Wellsville.	
623. ....	Iron stained sandstone, coating of micaeous ore.	J. Graber's farm, $\frac{1}{2}$ of a mile north-west of Wellsville.	Greenish in place.
624. ....	Magnetic syenite .....	Harman's farm, Altland's shaft in woods,	
625. ....	Alteration of sandstone to syenite (?) .....	2 miles north-west of Wellsville.	
626. ....	Mesozoic sandstone .....	Harman's farm, Altland's shaft on hill.	
627. ....	Bluish sandstone.....	Harman's farm.	
628. ....	Greenish sandstone containing magnetic ore	Store, on State road, near Wellsville.	
		Comfort's farm, 2 miles west of Wellsville.	

620.....	Sandstone carrying ore.....	J. Baker's farm, 1 mile west of Wellsville.
630.....	Grayish sandstone carrying ore .....	Comfort's farm, 2 miles west of Wellsville.
631.....	Hard sandstone .....	Near Comfort's Store, 2 miles west of Wellsville when in place.
23 632.....	Sandstone (slightly magnetic) .....	Dillsburg-Wellsville road.
633.....	Ferruginous sandstone .....	Comfort's. 2 miles west of Wellsville.
C. 634.....	Altered (?) ferruginous sandstone .....	Comfort's. Dillsburg-Wellsville road.
635.....	Syenite (?) .....	H. Kimmel's, 2 miles south-west of Wellsville.
636.....	Bluish argillaceous sandstone.....	State road to York, $\frac{1}{2}$ mile south-west of Wellsville.
637.....	Purplish slate.....	F. Cookson's farm, $\frac{1}{2}$ of a mile north-west of Rossville.
638.....	Sandstone.....	F. Cookson's, north-west of Rossville.
639.....	Blue mud-rock, baked .....	One-half mile north-west of Rossville.
640.....	Dolomite (?).....	One-half mile north-west of Rossville.
641.....	Blue mud-rock, hard and compact .....	Three-fourths of a mile north-west of Rossville.
642.....	Quartzite and micaceous ore.....	F. Cookson's farm, $\frac{1}{2}$ of a mile north-west of Rossville.
643.....	Argillaceous greenish sandstone .....	F. Cookson's, $\frac{1}{2}$ or a mile north-west of Rossville.
644.....	Trap (?) .....	Three-eighths of a mile north-west of Rossville.
645.....	Blue mud-rock.....	One-half mile north-west of Rossville.
646.....	Argillaceous sandstone.....	Old York road, $\frac{1}{2}$ mile east of Rossville.
647.....	Sandy mud-rock with surface lumps; material more argillaceous.	One-fourth of a mile south-west of Rossville.
648.....	Milky quartz.....	Three-fourths of a mile south-west of Rossville.
649.....	Trap (magnetic) .....	York road, $\frac{1}{2}$ of a mile south-west of Rossville.
650.....	Dolomite.....	"Old" York road, $1\frac{1}{4}$ miles east of Rossville.
651.....	Coarse red sandstone .....	Three miles south west of Rossville.
652.....	Blue mud-rock.....	York road $\frac{1}{2}$ of a mile south-west of Rossville.

Bottle-green when in place

Missing.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field num- ber of spec- imen.	Character.	Locality.	Remarks.
653.....	Olive colored argillaceous sandstone.....	York road $\frac{1}{4}$ of a mile south-west of Ross-ville.	
654.....	Argillaceous olive sandstone.....	One-eighth of a mile south-west of Ross-ville.	
655.....	Bluish sandstone.....	One-eighth of a mile south-west of Ross-ville.	
656.....	Clay.....	Jacob Brennenman's, $\frac{1}{4}$ mile north-west of Wellsville.	
657.....	Clay.....	M. Wiley's, 1 mile north of Wellsville.	
658.....	Blue mud rock.....	Foot of "Round Top," $3\frac{1}{2}$ miles north-east of Rossville.	
659.....	Gray sandstone, pink tint .....	North side of "Round Top," $3\frac{1}{2}$ miles north-east of Rossville.	
660.....	Bluish mud-rock.....	Foot of "Round Top," $3\frac{1}{2}$ miles north-east of Rossville.	
661.....	Trap.....	Foot of "Round Top."	
662.....	Trap.....	Foot of "Round Top."	
663.....	Weathered trap.....	Foot of "Round Top," $3\frac{1}{2}$ miles north-east of Rossville.	
664.....	Trap.....	Two miles north-east of Rossville.	
665.....	Fine-grained sandstone .....	Near mine bank, Altland's mine, $2\frac{1}{4}$ miles south-west of Wellsville.	
666.....	Argillaceous sandstone, copper coating .....	Jno. Sluthauer's, next to "Mine" bank.	
667.....	Variegated sandstone, with dark colored calcite crystals .....	Jno. Sluthauer's, 2 miles south-west of Wellsville.	
668.....	Magnetic ore .....	One mile north of Kralktown.	
669.....	Red shale.....	Just south-east of Kralktown (Hall P. O.)	
670.....	Greenish argillaceous sandstone.....	One-half mile east of Hall P. O.	
671.....	Coarse quartzose sandstone.....	One-fourth mile north-east of Hall P. O.	
672.....	Baked mud-rock .....		

673.....	Baked arenaceous mud-rock .....	Left bank of Bermudian Creek, $\frac{1}{2}$ mile south of Hall P. O.
674.....	Quartzite .....	Small run, $\frac{1}{4}$ mile north-east Hall P. O.
675.....	Very coarse sandstone .....	Carlisle-York road, $1\frac{1}{4}$ miles south-east of Dover.
676.....	Coarse sandstone .....	Carlisle-York road, 1 mile south-east of Dover.
677.....	Hard red sandstone .....	Carlisle-York road, $1\frac{1}{4}$ miles south-east of Dover.
678.....	Reddish sandstone .....	One-sixteenth of a mile north of Weigeltown.
679.....	Red conglomerate of quartz pebbles .....	Carlisle-York road $3\frac{1}{2}$ miles north-west of York.
680.....	Coarse red sandstone .....	Carlisle-York road, $\frac{1}{2}$ mile south-east of Weigeltown.
681.....	Purplish sandstone .....	Carlisle-York road, $2\frac{1}{2}$ miles north-west of York.
682.....	Dark gray sandstone, top rock .....	"Mine" bank, Altland's mine, $2\frac{1}{2}$ miles south-west of Wellsville.
683.....	Dark gray sandstone, bottom rock .....	"Mine" bank
684.....	Trap of alteration (?) .....	"Mine" bank, Altland's mine, $2\frac{1}{2}$ miles south-west of Wellsville.
685.....	Blue mud-rock, with aragonite .....	"Mine" bank.
686.....	Malachite .....	"Mine" bank.
687.....	Micaeons ore mixed with copper .....	"Mine" bank.
688.....	Catoite, with iron ore and copper .....	"Mine" bank.
689.....	"Clay," limonite .....	"Mine" bank.
690.....	Red sandstone .....	Carlisle-York road, 1 mile north-west of Dover.
691.....	Coarse gray sandstone with yellow grains .....	Carlisle-York road, $\frac{1}{2}$ of a mile north-west of Dover.
692.....	Mesozoic sandstone .....	Carlisle-York road, $\frac{1}{2}$ of a mile north-west of Dover.
693.....	Coarse sandstone .....	Carlisle-York road, $\frac{1}{2}$ mile south-east of Dover.
694.....	Bluish-green lamellar sandstone .....	Carlisle-York road, $\frac{1}{2}$ mile south-east of Dover.

Coated with micaeous ore.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber or spec- imen.	Character.	Locality.	Remarks.
695.....	Trap (fine and coarse grained) .....	North of Round Top, 5 miles north-east of Rossville.	
696.....	Slaty limestone .....	Allison's mill, $\frac{1}{2}$ mile north of Benade's opening.	
697.....	Mud-rock underlying limestone.....	Sprengle's farm, $\frac{1}{2}$ mile west of Mengis' Mill Station (Short Line railroad).	
698.....	Chlorite slate and limestone .....	Allison's mill, $\frac{1}{2}$ mile north of Benade's quarry.	Missing.
699.....	Hydro-mica chlorite slate.....	Wilson's farm, Benade's slate quarry.	
700.....	Ore.....	Sprengle's farm, $\frac{1}{2}$ mile west of Mengis' Mill Station, (Short Line railroad.)	
701.....	Pure limonite.....	Sprengle's farm, $\frac{1}{2}$ mile west of Mengis' Station.	
702.....	Magnetic ore .....	Martin Smyser, 1 mile east of Dillsburg.	
703.....	Ore.....	H. C. Sheiley's, Cumberland county, near Fuller's mine.	
704.....	Earthy Hematite .....	Two miles north-west of Wellsville.	
705.....	Scale of vein matter 40' from surface and crystals of specular iron.	Harman's blacksmith shop.	
706.....	Trap.....	J. Deardorff's farm, 3 miles east of Dillsburg.	
707.....	Trap.....	One-half mile north-east of New Chester (Adams County).	
708.....	Thin slab friable gray and purple streaked sandstone.	One mile south-west of New Chester.	
709.....	Argillaceous sandstone.....	Near fork Dillsburg-York road, 1 mile north of Dover.	
710.....	Coarse red sandstone.....	Ore-digging at brick yard north-east of Gettysburg.	
711.....	Red sandstone.....	Dillsburg-York road, 1 mile north-west of Dover.	
		Conewago hills, Dover-Dillsburg road, 2 miles north-west of Dover.	

712.....	Shale containing magnetic ore .....	Southeast bending of first gangway. Mickley's mine, 2 miles north-west of M'Knightstown (Adams County).
713.....	Crystallized calcite occurring in ore.....	Middle level of slope, Adam Minter's farm, 2 miles north-west of M'Knight- town.
714.....	White argillaceous sandstone .....	Minter's farm.
715.....	Green chloritic top rock .....	Minter's farm.
716.....	Calcite in ore .....	Minter's ore bank, 55 foot level.
717.....	Decomposed clay shale.....	Foot wall at heading of first gangway. Minter's farm.
718.....	Trap.....	Carriage shop, Chambersburg pike, 3 miles north-west of Gettysburg.
719.....	Trap.....	Chambersburg pike, 3 miles north-west of Gettysburg.
720.....	Calcareous conglomerate .....	Minter's farm and ore bank, 2 miles north-west of M'Knightstown.
721.....	Red sandstone .....	2 miles north north-west of M'Knight- town, Minter's bank.
722.....	Clay.....	A. Minter's ore bank, 2 miles north north-west of M'Knightstown.
723.....	Baked mud rock .....	A. Minter's bank, 2 miles north north- west of M'Knightstown.
724.....	Hydro-mica slate (?) .....	One mile north north-west of Glen Rock, N. C. R. R.
725.....	Sandy slates.....	One mile south-east of Spring Forge, road to Hanover Junction.
726.....	Sandstone, slate and milky quartz, .....	One mile east of Spring Forge. Geo. Fange's quarry, G. H. and H. J. R. R., at Hanover.
727.....	Trap.....	Glen Rock, N. C. R. R.
728.....	Chlorite slate, heavy bedded..	One mile east of Spring Forge.
729.....	Limestone.....	One mile east of Spring Forge.
730.....	Hydro-mica slate with pyrite casts.....	One and a half miles north-west of Han- over Junction.
731.....	Sandy slate.....	One mile east of Spring Forge.
732.....	Dolomite (?).....	Seminary Ridge, $\frac{1}{2}$ of a mile north-west of Gettysburg.
733.....	Slate.....	Forrey's farm, $\frac{1}{2}$ of a mile south of Menges' Station, S. L. R. R.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
734.....	Chloritic slates convoluted.....	One-half mile south of Seitzland Station, N. R. C. R.	
735.....	Trap.....	Dillsburg's bank; 2 miles north north-	
736.....	Ore (slightly magnetic).....	west of M'Knightstown. Shrewsbury, on N. C. R. R.	
737.....	Calcareous slate.....	Glen Rock, N. C. R. R.	
738.....	Arenaceous chlorite slate.....	Logansville, on Baltimore-York pike.	
739.....	Trap.....	Red Lion Station, Peach Bottom rail-	
740.....	Hydro-mica slate.....	Road. Dallastown Station, Peach Bottom rail-	
741.....	Hydro-mica slate.....	road. Red Lion Station, Peach Bottom rail-	
742.....	Hydro-mica slate.....	road.	
743.....	Hydro-mica slate with pis of pyrites.....	One and a half miles north-west of Dal- lastown Station, P. B. R. R.	
744.....	Sandy hydro-mica slate.....	Fissel's Mill, $\frac{1}{4}$ mile north by east of tun- nel, N. C. R. R.	
745.....	Hydro-mica slate.....	Springvale Station, Peach Bottom rail-	
746.....	Trap.....	road. One mile north of Hanover on Carlisle	
747.....	Micaeous ore.....	pike. Near Bindersville, Shearer's farm.	
748.....	Hydro-mica slate.....	Just north of Shrewsbury, N. C. R. R.	
749.....	Calcareous slate.....	Just south of Shrewsbury, N. C. R. R.	
750.....	Ferruginous slate.....	One mile north of New Freedom, to right of N. C. R. R.	
751.....	Hydro-mica slate.....	Maryland State line.	
752.....	Micaeous slate with quartz.....	Glen Rock, N. C. R. R.	
753.....	Cavernous quartzite with quartz.....	One mile east of Enigsville.	
754.....	Hydro-mica slate (?).....	One mile south of Wrightsville.	
		Resembling limestone in parts.	

755.....	Blue slate.....	One mile south of Wrightsville.
756.....	Argillaceous mica slate (?) .....	One mile south of Wrightsville.
757.....	Micaceous argillite slate.....	Two miles north of Glen Rock, N. C. R.R.
758.....	Argillite slate.....	One mile south of Glen Rock, N. C. R.R.
759.....	Earthy mica slate .....	Three miles north of Wrightsville.
760.....	Trap.....	One mile south of Glen Rock, N. C. R.R.
761.....	Trap.....	Lichly's ore bank, 4 miles north of Berlin.
762.....	Impure ore.....	Lichly's ore bank, 4 miles north of Berlin.
763.....	Trap.....	Lichly's ore bank, 4 miles north of Berlin.
764.....	Bluish mud-rock .....	J. T. Smith's farm, 5 miles north-west of Dover.
765.....	Fine-grained trap .....	W. R. Smith's farm, 4½ miles north-west of Dover, on State road.
766.....	Micaceous ore.....	Lichly's ore bank, 4 miles north of Berlin.
767.....	Micaceous ore .....	J. T. Smith's farm, 5 miles north-west of Dover.
768.....	Dolerite .....	J. T. Smith's farm.
769.....	Purplish mud-rock .....	Lichly's ore bank, 4 miles north of Berlin.
770.....	Decomposed greenish sandstone carrying ore.	J. T. Smith's farm, 5 miles north-west of Dover.
771.....	Trap.....	J. T. Smith's farm, 5 miles north-west of Dover.
772.....	Earthy limestone .....	Mine N. 3, Mont Alto, Franklin county.
773.....	Ore from shaft.....	W. R. Smith's farm, 4½ miles north-west of Dover.
774.....	New red sandstone from shaft .....	W. R. Smith's farm.
775.....	Arenaceous red shale .....	Bermudian creek, on old Berlin road.
776.....	New red sandstone.....	Hoopes' mill, on Bermudian, 1 mile east of south of Hall P. O.
777.....	Purplish mud-rock .....	Hoopes' mill, on Bermudian, 1 mile east of south of Hall P. O.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov's'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
778.....	Red shale.....	Bermudian creek, near Hoopes' mill, 1 mile above dam.	
779.....	Variegated sandstone .....	Bermudian creek, $\frac{1}{4}$ mile below Hoopes' mill, right bank.	
780.....	Trap.....	Hoopes' mill, on Bermudian creek.	
781.....	Blue shale, arenaceous.....	Bermudian creek, $1\frac{1}{2}$ miles south-west of Mechanicsville.	
782.....	Dolerite .....	Mill dam opposite sandstone quarry, $1\frac{1}{4}$ miles south-west of Mechanicsville, Bermudian creek.	
783.....	Greenish arenaceous shale.....	Sane creek, at stone mill, 3 miles south-east of Petersburg.	
784.....	Quartzose conglomerate .....	Latinmore creek, $\frac{1}{2}$ miles south-east of Petersburg.	
785.....	Variegated sandy mud-rock.....	Bermudian creek, at Stone mill, 2 miles south-east of York Springs.	
786.....	Red quartz conglomerate .....	Branch of Latinmore creek, near Sawmill dam, 2 miles north of York Springs.	
787.....	Bog ore, large quartz pebbles imbedded..	D. P. Lerew's farm, 2 miles north of Petersburg.	
788.....	Trap.....	D. P. Lerew's farm, 2 miles north of Petersburg.	
789.....	Green calcareous rock.....	D. P. Lerew's farm, 2 miles north of Petersburg.	
790.....	Ferruginous sandstone.....	Lichty's ore bank, 4 miles north of Berlin.	
791.....	Float ore.....	Adam Hess' farm, on Bermudian creek, near Trimmer's mill.	
792.....	Limestone conglomerate.....	Mac Williams' slope, 1 mile east of Dillsburg.	

793.....	Quartzite, rose tint, curious fracture .....	Near Idaville, $1\frac{1}{2}$ miles east of Idaville, on road to Bruch's mine.
794.....	Coarse-grained trap .....	Fork of Oxford and Brean's mill roads, east of Idaville.
795.....	Blue and white streaked slate-rock .....	Near A. Mcal's farm, near Idaville.
796.....	Trap.....	Idaville road, Idaville-Petersburg, 2 miles north of Idaville.
797.....	Ferruginous coarse-grained trap.....	Petersburg-Idaville road, 2 miles north of Idaville, near Plank's farm.
798.....	Micaeaceous ore and red oxide, inclosing green sand.....	Aitland's mine, Washington township, York county.
799.....	Syenitic granite.....	Harriman's blacksmith shop.
800.....	Ore with interstratified sandstone and pebbles of same.....	Mac Williams' Mine, 1 mile east of Dills- burg.
801.....	Dolerite .....	Aitland's mine, York county.
802.....	Trap (?) .....	Aitland's mine.
803.....	Micaeaceous ore .....	M' Cormick's mine.
804.....	Testaceous ilmenite .....	Hake's bank, 3 miles west of Dillsburg.
805.....	Mass of sandstone and ore in contact with trap.....	Aitland's mine.
806.....	Hard cupriferous ore .....	Logan's shaft, Dillsburg.
807.....	Mammillated ore with nodules of man- ganese (?) .....	C. Bender's, 1½ miles south-west of Dills- burg.
808.....	Variegated clay and testaceous ore .....	C. Bender's bank, 1½ miles south-west of Dillsburg.
809.....	Green sandstone mixed with ore.....	Logan's shaft, Dillsburg.
810.....	Mixed ore and green sandstone, contain- ing crystals of feldspar.....	Bender's mine, 1½ miles south-west of Dillsburg.
811.....	Cupiferous decomposed schistus.....	A. Minter's bank, north north-west of McKnightstown.
812.....	Ore from upper level of slope.....	A dam Hess' farm, Bermudian creek, 4 miles above Trimmer's mill.
813.....	Red shale.....	One mile above Trimmer's mill, Ber- mudian creek.
814.....	Reddish argillite, spots and streaks of green.....	One mile north-west of Trimmer's mill,
815.....	Hard finely laminated argillito .....	Bermudian creek.

Slightly magnetic.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field number of specimen.	Character.	Locality.	Remarks.
816.....	Sandy argillite .....	One-fourth mile east of Trimmer's mill, Bermudian creek.	
817.....	Red sandstone .....	One-fourth mile east of Trimmer's mill, Bermudian creek.	
818.....	Red sandstone .....	Near Trimmer's mill, Bermudian creek.	
819.....	Coarse-grained red sandstone.	One-eighth of a mile east of Trimmer's mill, Bermudian creek.	
820.....	Finely laminated fine-grained red sandstone.	One-fourth mile west, by south along creek, below dam, Trimmer's mill.	
821.....	Red sandstone .....	Kidd's mill, 2 miles south-east of Kralltown, Bermudian creek.	Missing.
822.....	Fine-grained syenite, containing vein of quartz, quartiz dolerite.	Two miles south of Kralltown, Bermudian creek.	
823.....	Dolerite .....	Kidd's mill, 2 miles south of Kralltown, Bermudian creek; up creek, $\frac{1}{4}$ of a mile above mill.	
824.....	Hard blue argillite or mud-rock .....	Kidd's mill, Bermudian creek, below mill.	
825.....	Hard purplish-green argillite .....	One-eighth mile below Kidd's mill, Bermudian creek.	
826.....	Bluish argillite or mud-rock .....	Same locality, left bank.	
827.....	Dolerite .....	One-eighth mile below mill, left bank.	
828.....	Trap .....	One-eighth mile below mill, left bank.	
829.....	Coarse-grained trap .....	One eighth mile above mill, on right bank.	
830.....	Argillaceous variegated sandstone .....	One-eighth mile above Kidd's mill, Bermudian creek, 2 miles south-east of Kralltown.	
831.....	Quartzose sandstone, green streaks, mica ore coating.	Opposite Kidd's mill, on Bermudian creek.	
832.....	Grayish-yellow spotted sandstone .....		

833.....	Blue mud-rock .....	One-fourth mile above Kidd's mill, Bermudian creek.
834.....	Mesozoic quartzose sandstone .....	One-fourth mile above Kidd's mill, Bermudian creek.
835.....	Hornblende rock .....	Adam Lerew's farm, $2\frac{1}{2}$ miles north from Petersburg.
836.....	Magnetic surface ore .....	Adam Lerew's farm, $2\frac{1}{2}$ miles north from Petersburg.
837.....	Weathered orthofelsite slate .....	Three miles north of Petersburg.
838.....	Epidote rock (?) or so-called copper rock.	Near Adam Lerew's farm, 3 miles north of Petersburg.
839.....	Decomposed slate .....	Three miles north of Petersburg, South Mountain, near Lerew's store.
840.....	Crypto-crystalline slate .....	Near Lerew's store, 3 miles north of Petersburg.
841.....	Orthofelsite slate .....	Three miles north of Petersburg, near Lerew's store.
841.....	Orthofelsite slate .....	Carlisle pike near Lerew's store. Road, 4 miles from Petersburg.
843.....	Chlorite schist with veins of quartz.	Short distance beyond county line, Carlisle pike, $4\frac{1}{2}$ miles from Petersburg.
844.....	Orthofelsite porphyry .....	Carlisle pike, 5 miles from Petersburg.
845.....	Dolerite ....	Near county line, $5\frac{1}{2}$ miles north-west of Petersburg.
816.....	Quartzose schist .....	Carlisle pike, $5\frac{1}{2}$ miles north-west of Petersburg.
847.....	Quartzose schist, partly red in color.	Carlisle pike, $5\frac{1}{2}$ miles north-west of Petersburg.
848.....	Orthofelsite porphyry .....	Carlisle pike, 6 miles north-west of Petersburg.
849.....	Quartzose schist .....	Carlisle pike, 6 miles north-west of Petersburg.
850.....	Brown hematite ore .....	Mt. Holly ore bank, Medier and Layor's.
851.....	Brown hematite ore .....	Mt. Holly ore bank, Thomas Iron Co.
851.....	Limonite clay (?) .....	Mt. Holly ore bank, Thomas Iron Co.
853.....	Greenish sandy schist .....	Mill dam, S. M. R. R., 1 mile north-east of Paper town.
854.....	Greenish sandstone .....	At Mt. Holly paper mill.
855.....	Greenish quartzite .....	S. M. R. R. cut at Paper town.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field num- ber of spec- imen.	Character.	Locality.	Remarks.
836.....	Silty sandstone .....	Sth. Mt. R. R.-out at Papertown.	
837.....	Brown and gray quartzite .....	Sth. Mt. R. R.-out, Papertown.	
838.....	Rose-tinted quartzite .....	Sth. Mt. R. R.-out, Papertown.	
839.....	Greenish crystalline schist.....	Carlisle pike, 5 miles north-west of Petersburg.	
840.....	Greenish crystalline slate rock .....	Carlisle pike, 4 miles north-west of Petersburg.	
841.....	Greenish crystalline slate rock .....	Carlisle pike, $3\frac{1}{2}$ miles north-west of Petersburg.	
842.....	Greenish crystalline slate .....	Two and three-fourths miles north-west of Petersburg, on Carlisle pike.	
843.....	Greenish crystalline slate .....	Two and a half miles north-west of Petersburg. Carlisle pike.	
844.....	Micaceous ore .....	Mr. Hines' farm, $2\frac{1}{2}$ miles north-west of Petersburg. Carlisle pike.	
845.....	Orthofelsite .....	Carlisle pike, $2\frac{1}{2}$ miles north-west of Petersburg.	
846.....	Trap .....	Carlisle pike, 2 miles north-west of Petersburg.	Missing.
847.....	Surface micaceous ore .....	Jno. Myers' farm, $2\frac{1}{2}$ miles north of Petersburg.	
848.....	Clay slate .....	Monosmith's farm, 2 miles south-east of Papertown.	Weathered from schist.
849.....	Weathered crystalline schist .....	Meer's house, 4 miles north-west of Petersburg.	
850.....	Green chloritic shale, with crystals of chloritoid.	Near Idaville, 4 miles north-west of Petersburg.	
851.....	Hydro-mica schist .....	Carlisle pike, 2 miles south-east of Papertown.	
872....	Chlorito slate .....	A. Meal's farm, $1\frac{1}{2}$ miles east of Idaville.	

873 . . . . .	Dolerite . . . . .	Near Colson's house, 4 miles north of Petersburg, on New Oxford and Paper-town.
874 . . . . .	Limonite . . . . .	Lear's limestone quarry, Carlisle Pike, 2 miles north-west of Petersburg.
875 . . . . .	Variously colored limestone; also calcite.	Lear's limestone quarry, 2 miles north-west of Petersburg.
876 . . . . .	Crystalline slate, green . . . . .	Two and a half miles north-west of Petersburg, Petersburg-Idaville road.
877 . . . . .	Greenish trap (?) . . . . .	Petersburg-Idaville road, 2 miles north-west of Petersburg.
878 . . . . .	Quartzose conglomerate . . . . .	Two and a half miles north-west of Petersburg.
879 . . . . .	Calcareous rock . . . . .	Mengis' quarry, 3 miles north-west of Petersburg.
880 . . . . .	Ferruginous calcite from bed, hematite . . . . .	Mengis' limestone quarry, 3 miles north-west of Petersburg.
881 . . . . .	Quartzite or coarse sandstone . . . . .	Two and a half miles from Idaville. Idaville and Petersburg road.
882 . . . . .	Weathered orthofelsite slate . . . . .	Two and a half miles from Idaville. Idaville and Petersburg road.
883 . . . . .	Bluish crystalline slate rock, . . . . .	Two miles from Idaville. Idaville and Petersburg road.
884 . . . . .	Orthofelsite, with seams of quartz . . . . .	Six miles north of Bendersville.
885 . . . . .	Orthofelsite. . . . .	One-half mile north-east of Pine Grove, South Mountain.
886 . . . . .	Mesozoic conglomerate . . . . .	Three-fourths a mile south of Bendersville.
887 . . . . .	Weathered orthofelsite . . . . .	Bendersville and Pine Grove road, one mile north-west of Bendersville.
888 . . . . .	Float ore . . . . .	Near Thomas Iron Co.'s quarry. Pine Grove.
889 . . . . .	Sandy chlorite schist . . . . .	Three miles north-west of Bendersville, on Pine Grove road.
890 . . . . .	Decomposed trap . . . . .	One half mile south of Bendersville and Geitysburg road.
891 . . . . .	Dolerite . . . . .	On Oxford road, 1 mile from Carlisle pike, Cumberland county.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field num- ber of spe- cimens.	Character.	Locality.	Remarks.
832.....	Splintery chlorite schist .....	On right fork of N. Oxford road, $\frac{1}{2}$ mile south-east of John Peters.	
833.....	Sandy chloritic argillite.....	Near Jno. Peters, $\frac{1}{2}$ mile south-east from his place.	
834.....	Mica schist, with rose-colored quartz.....	Near county line, 4 miles north-west of Bendersville.	
835.....	Chloritoid rock .....	One-half mile north-west of Bendersville.	
836.....	Mountain creek rock.....	Near summit of first ridge, Bendersville and Pine Grove road.	
837.....	Limestone (lower bench) .....	Thomas Iron Co.'s limestone quarry, Pine Grove.	
838.....	Very arenaceous slate.....	One-half mile north-west of Bendersville.	
839.....	Finely laminated cryptocrystalline slate, blue and white streaks along bed plane,	One-fourth mile north-west of Bendersville.	
900.....	Schistose conglomerate.....	Two miles north-east of Pine Grove.	
901.....	Impure limonite.....	Thomas Iron Co.'s bank on Bendersville and Pine Grove road, $\frac{1}{2}$ mile from Pine Grove.	
902.....	Clay slate .....	Mt. Holly ore bank, Thomas Iron Co.	
903.....	Schistose conglomerate, quartz and chlo- rite fragments .....	Three miles north-east of Pine Grove, on road to Milltown.	
904.....	Orthofelsite.....	Three-fourths mile north-west of Ben- dersville.	
905.....	Talcose schist, with quartz pebbles .....	Summit of South mountain, 4 miles from Pine Grove, on the Milltown road.	
906.....	Limestone (upper bench) .....	Thomas Iron Co.'s quarry, Pine Grove.	
907.....	Chlorite, with seams of quartz.....	Last summit of South mountain, 4 miles from Pine Grove.	

908.....	Hydro-mica slate, with pits of pyrite.....	One-fourth mile from county line, near Jno. Peters'.
909.....	Green S.S., surrounded by lenticular folia, very thin and stained brown.	One mile south-east of Papertown, under bank of Stl. Mt. R. R. Co. At Colson's on Oxford road, two miles from Carlisle pike.
910.....	Crypto-cryst. schist.....	Oxford road, 1 mile from pike.
911.....	Orthofelsite porphyry.....	Oxford road, 3 miles from pike.
912.....	Orthofelsite porphyry.....	Thomas Iron Co.'s bank, 1 mile south-east of Papertown.
913.....	Pure testaceous limonite. ....	Oxford road, 3 miles from Papertown.
914.....	Quartz, with chlorite schist coating.....	Two and a half miles from Papertown, near pike, on the Oxford road.
915.....	Orthofelsite porphyry.....	Two miles north-east of Pine Grove, South mountain.
916.....	Variegated, red, pink, yellow chlorite schist, thin laminae.	Daniel Peters' saw mill, 1 mile north-east of Bendersville.
917.....	Conglomerate quartz and calcite in chalcocite.	Old Whitestown bank, 2 miles south-east of Idaville.
918.....	Clay partings of felsitic mass.....	Cemetery on Petersburg and Bendersville road, $\frac{1}{2}$ miles north-east of Bendersville.
919.....	Slaty orthofelsite porphyry.....	Bendersville road, one-eighth mile south of saw mill.
920.....	Dolerite .....	Old Whitestown bank.
921.....	Impure limonite.....	Bendersville road, 3 miles north-west of Bendersville.
922.....	Sandstone, with seam of quartz. ....	Near J. Weaver's, $\frac{1}{2}$ mile north of Centre Mills.
923.....	Green S.S. enclosing fragments of calcite, felspar, etc, also a lenticular concretion.	Virginia Mills road, 1 mile north of Millerstown road.
924.....	Orthofelsite porphyritic and jaspery varieties.	Mt. Alto, Franklin county.
925.....	Limestone.....	Three miles north of Mt. Alto furnace, near Pond bank.
926.....	Hematite.....	Near Cold Spring, 4 miles west of Millerstown.
927.....	Banded sandy slate.....	Three and a half miles north of Mt. Alto, Franklin county.
928.....	Quartzose S. S., with specular ore.....	

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
929.....	Ripple marks on new red sandstone.....	Near South mountain, $2\frac{1}{2}$ miles north-east of Millerstown,	
930.....	Impure ore.....	No. 5 shaft, $\frac{2}{3}$ of a mile north of Mt. Alto furnace.	
931.....	White clay underlying ore.....	Mine No. 3, $\frac{1}{2}$ mile from Mt. Alto furnaces, Franklin county.	
932.....	White clay underlying ore.....	No. 5 shaft, Mt. Alto furnace.	
933.....	Iron ore sand.....	Near "Track road,"	
934.....	Blue limestone on crest of hill.....	Beeler's cross-roads, York county.	
935.....	Dark limestone.....	Near top of Shunk's hill, Baltimore pike, York.	
936.....	Slate and micaceous ore.....	Strickhouse's.	
937.....	Crystalline schistis.....	One-half mile south of Wrightsville.	
938.....	Schistose limestone.....	Ziegler's.	
939.....	Limestone.....	Near Beeler's cross-roads, where limestone merges into sandy slate.	
940.....	Conglomerate limestone between uncon- formable blue and white beds.	Hoke's quarry, $\frac{1}{2}$ mile south of York, New Salem road.	
941.....	Limestone.....	First quarry, New Salem road.	
942.....	White limestone.....	Near Beeler's cross-roads (120 yards east of.)	
943.....	Tereaceous limonite, with associated schists and clay.	Wilton's bank, $\frac{1}{2}$ mile south-east of Wrightsville.	
944.....	Calcareous slate, with associated flakes of schist.....	One-eighth mile north of Cline's run, York county.	
945.....	Limestone conglomerate.....	Near Detweiller's quarry, in north part of Wrightsville.	
946.....	Saponaceous clay.....	Wilton's bank, one-half mile south-east of Wrightsville.	
947.....		Wm. Hoke's on Gettysburg pike, near York.	

918	Sandy slate .....	Wittner's mill, on Yellow Breeches creek, Carlisle pike, Cun. County.
919	Hard light blue dolomite, feebly effervescent, and hydro-mica schist.	Spring Forge mill, cut S. L. R R., $\frac{1}{4}$ mile west of Spring Forge.
920	Sandy slate .....	Short Line R. R. cut, $\frac{1}{2}$ mile west of Spring Forge.
24 921	Slate .....	Missing.
922	Limestone .....	
923	Orthofelsite, with admixture of talcose schist.	Sprenkle's farm, $\frac{1}{4}$ mile west of Meng's mill, Short Line R. R.
924	Orthofelsite porphyry .....	Cross-roads, 1 mile south-east of Idaville.
925	Orthofelsite .....	Road to Bendersville, one mile south-east of Idaville.
926	Orthofelsite, with admixture of sand.	Near stone school house, $2\frac{1}{2}$ miles north east of Bendersville.
927	Orthofelsite containing magnetite .....	Three miles north-east of Bendersville. Road to Carlisle road, 2 miles from Bendersville.
928	Sandy slate .....	Three miles north-east of Bendersville.
929	Slaty orthofelsite .....	Two miles north-west of Bendersville.
930	Orthofelsite containing magnetite .....	J. Wickersham's, 2 miles north-west of Bendersville; called ore by him.
931	Bluish white silty orthofelsite .....	J. Wickersham's, 2 miles north-west of Bendersville.
932	Orthofelsite porphyry (weathered) .....	Near Pine Grove road, $\frac{1}{2}$ mile east of same, 3 miles north-west of Bendersville.
933	Orthofelsite .....	Same locality, $\frac{1}{2}$ mile east of state road to Pine Grove.
934	Orthofelsite .....	State road to Pine Grove, at county line.
935	Hydro-mica schist containing small bluish-colored quartz pebbles .....	State road to Pine Grove, near county line.
936	Light bluish limestone, with calcite .....	Lower bed in quarry, (Stuart's,) Pine Grove, Cumberland County.
937	Bluish limestone with fluorite and calcite coating.	Stuart's quarry, $\frac{1}{4}$ miles south-east of Pine Grove.
938	Limestone with fluorite and calcite .....	Stuart's quarries, Pine Grove.
939	Limestone with aragonite .....	Stuart's quarries, Pine Grove.
940	Limestone and crystallized calcite .....	Stuart's quarries, Pine Grove.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
929.....	Ripple marks on new red sandstone.....	Near South mountain, $2\frac{1}{4}$ miles north-east of Millerstown, No. 5 shaft, $\frac{2}{3}$ of a mi. e north of Mt. Alto furnace.	
930.....	Pure ore.....	Mine No. 3, $\frac{1}{2}$ mile from Mt. Alto fur- nace, Franklin county. No. 5 shaft, Mt. Alto furnace.	
931.....	White clay underlying ore.....	Near "Track road," Beeler's cross-roads, York county.	
932.....	White clay underlying ore.....	Near top of Shunk's hill, Baltimore pike, York.	
933.....	Iron ore sand.....	Strickhouser's, One-half mile south of Wrightsville.	
934.....	Blue limestone on crest of hill.....	Ziegler's,	
935.....	Dark limestone.....	Near Beeeler's cross-roads, where lime- stone merges into sandy slate.	
936.....	Slate and micaceous ore	Hole's quarry, $\frac{1}{2}$ mile south of York, New Salem road.	
937.....	Crystalline schistus.....	First quarry, New Salem road.	
938.....	Schistose limestone.....	Near Beeeler's cross-roads (120 yards east of.)	
939.....	Limestone.....	Wilton's bank, $\frac{1}{2}$ mile south-east of Wrightsville.	
940.....	Conglomerate limestone between uncon- formable blue and white beds.	One-eighth mile north of Cline's run, York county.	Missing.
941.....	Limestone.....	Near Detweiler's quarry, in north part of Wrightsville.	
942.....	White limestone.....	Wilton's bank, one-half mile south-east of Wrightsville.	
943.....	Tfestaceous limonite, with associated schists and clay.	Wm. Hoke's on Gettysburg pike, near York.	
944.....	Calcareous slate, with associated flakes of schist.....		
945.....	Limestone conglomerate.....		
946.....	Saponaceous clay.....		
947.....			

948	Sandy slate.....	Witner's mill, on Yellow Breeches creek, Carlisle pike, Cumm. County.
949	Fair light blue dolomite, feebly effervescent, and hydro-mica schist.	Spring Forge mill, cut S. L. R.R., $\frac{1}{4}$ mile west of Spring Forge.
950	Sandy slate.....	Short Line R. R. cut, $\frac{1}{2}$ mile west of Spring Forge.
24 951	Slate.....	Missing.
952	Limestone.....	Short Line R. R.
953	Orthofelsite, with admixture of talcose schist.	Sprenkle's farm, $\frac{1}{4}$ mile west of Mengis' mill, Short Line R. R.
954	Orthofelsite porphyry.....	Cross-roads, 1 mile south-east of Idaville.
955	Orthofelsite .....	Road to Bendersville, one mile south-east of Idaville.
956	Orthofelsite, with admixture of sand.....	Near stone school house, $2\frac{1}{2}$ miles north east of Bendersville.
957	Orthofelsite porphyry.....	Three miles north-east of Bendersville.
958	Sandy slate.....	Road to Carlisle road, 2 miles from Bendersville.
959	Slaty orthofelsite .....	Three miles north-east of Bendersville.
960	Orthofelsite containing magnetite.....	Two miles north-west of Bendersville.
961	Bluish white slaty orthofelsite .....	J. Wickersham's, 2 miles north-west of Bendersville ; called ore by him.
662	Orthofelsite porphyry (weathered) .....	Near Pine Grove road, $\frac{1}{2}$ mile east of same, 3 miles north-west of Bendersville.
963	Orthofelsite .....	Same locality, $\frac{1}{4}$ mile east of state road to Pine Grove.
964	Orthofelsite .....	State road to Pine Grove, at county line.
965	Hydro-analc. schist containing small bluish-colored quartz pebbles .....	State road to Pine Grove, near county line.
966	Light bluish limestone, with calcite .....	Lower bed in quarry, (Stuart's,) Pine Grove, Cumberland County.
967	Bluish limestone with fluorite and calcite coating.	Stuart's quarry, $\frac{1}{4}$ miles south-east of Pine Grove.
968	Limestone with fluorite and calcite .....	Stuart's quarries, Pine Grove.
969	Limestone with aragonite .....	Stuart's quarries, Pine Grove.
970	Limestone and crystallized calcite .....	Stuart's quarries, Pine Grove.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'slal field num- ber of spe- cimens.	Character.	Locality.	Remarks.
971.....	Limonite.....	Thomas Iron Co.'s bank at Pine Grove.	
972.....	Green crystalline schist.....	North-east end of Pine Grove.	
973.....	Chlorite and orthofelsite .....	North-east of Pine Grove $\frac{1}{4}$ mile, on road to Milltown.	
974.....	Orthofelsite porphyry .....	One-fourth mile north-east of Pine Grove, road to Milltown.	
975.....	Light gray chlorite schist .....	One-half mile north-east of Pine Grove, Cumberland County.	
976.....	Chlorite schist, bluish and red tints.....	One-half mile north-east of Pine Grove.	
977.....	Variegated chlorite schist, with chlorite.....	One-half mile north-east of Pine Grove.	
978.....	Dull red colored argillite .....	One mile north-east of Pine Grove, Milltown road.	
979.....	Chlorite schists .....	One mile north-east of Pine Grove, Milltown road.	
980.....	Quartzose or conglomeritic schist .....	One and a half miles north-east of Pine Grove, Milltown road.	
981.....	Quartzose crystalline schist.....	One and a half miles north-east of Pine Grove, Milltown road.	
982.....	Chlorite schist, inclosing seam of quartz.....	Three miles north-east of Pine Grove, Milltown road.	
983.....	Conglomerate schist.....	Two miles north-east of Pine Grove, Milltown road.	
984.....	Green crystalline schist, slightly con- generative.....	Three miles north-east of Pine Grove.	
985.....	Fusile quartzite.....	Three and a half miles north-east of Pine Grove, Milltown road.	
986.....	Dark blue limestone.....	On Yellow Breeches creek, $\frac{1}{4}$ mile north-west of Bustleton, Cumberland Co., Cribb's farm.	
987.....	Dark blue limestone.....	Same place.	

988.....	Orthofelsite .....	Two miles west of north of Bendersville, on State road to Pine Grove.
989.....	Chlorite schist.....	Two miles west of north of Bendersville, Pine Grove road.
990.....	Orthofelsite porphyry.....	Two miles west of north of Bendersville, Pine Grove road.
991.....	Same, black base, weathered.....	Same locality.
992.....	Variegated chlorite schists .....	Near school house, 2 miles north-west of Bendersville.
993.....	Chlorite schist .....	At school house, 2 miles north-west of Bendersville.
994.....	Chlorite schist .....	School house, 2 miles north-west of Bendersville.
995.....	Orthofelsite porphyry.....	Near school house, 2 miles north-west of Bendersville.
996.....	Finely laminated orthofelsite .....	Three miles north-west of Bendersville.
997.....	Compact orthofelsite .....	Three miles north-west of Bendersville.
998.....	Slaty orthofelsite porphyry .....	Three and one-fourth miles north-west of Bendersville.
999.....	Micaeaceous and magnetic ore .....	Mr. Wahley's farm, $\frac{1}{2}$ of a mile north-west of Bendersville.
1000.....	Orthofelsite porphyry .....	Three and a half miles north-west of Bendersville.
1001.....	Orthofelsite porphyry .....	Three and a half miles north-west of Bendersville, at Wahley's.
1002.....	Pseudomorphs of quartz after chlorite (?)	Three and a half miles north-west of Bendersville, at Wahley's.
1003.....	Epidote rock .....	Same locality.
1004.....	Compact orthofelsite .....	Four miles north-west of Bendersville.
1005.....	Orthofelsite porphyry .....	Four and one-fourth miles north-west of Bendersville.
1006.....	Epidote rock (?) .....	Four and one-fourth miles north-west of Bendersville.
1007.....	Chlorite and quartz .....	Four and a half miles north-west of Bendersville.
1008.....	Orthofelsite porphyry .....	Four and a half a miles north-west of Bendersville.
1009.....	Orthofelsite porphyry .....	Four and three-fourths miles north-west of Bendersville.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'slal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
1010.....	Slaty orthofelsite.....	Four and three-fourths miles north-west of Bendersville.	
1011.....	Orthofelsite porphyry.....	Four and three-fourths miles north-west of Bendersville.	
1012.....	Chlorite and quartz.....	Three and a half miles north of Arendtsville.	
1013.....	Chlorite schist.....	Four miles north-west of Arendtsville.	
1014.....	Slaty orthofelsite.....	School house and church, 1 mile east of Arendtsville, Shippensburg road.	
1015.....	Pearly crystalline schist.....	One-fourth of a mile west of school house and church.	
1016.....	Slaty orthofelsite.....	One-half mile east of Arendtsville, Shippensburg road.	
1017.....	Compact slaty orthofelsite .....	Two and a half miles north of Arendtsville.	
1018.....	Chlorite schist.....	Three and a half miles north-west of Bendersville, Shippensburg road.	
1019.....	Quartzite.....	One mile north of Wrightsville.	
1020.....	Sandy slate.....	One mile north of Wrightsville.	
1021.....	Sandy slate.....	One mile north of Wrightsville.	
1022.....	Sandy slate.....	One mile north of Wrightsville.	
1023.....	Sandy slate.....	One mile north of Wrightsville.	
1024.....	Quartzite with seams of quartz .....	Three-fourths of a mile north of Wrightsville.	
1025.....	Sandy slate.....	One-half mile north of Wrightsville.	
1026.....	Sandy slate.....	One-fourth mile north of Wrightsville.	
1027.....	Shale containing nodules of limestone.....	One quarter mile north of Wrightsville.	
1028.....	Slaty limestone.....	One-eighth mile north of Wrightsville.	
1028.....	Limestone conglomerate .....	Northern end of Wrightsville, Detweller's quarry.	

1030.....	White conglomerate limestone .....	One-sixteenth of a mile north of Wrightsville, Detweller's quarry.
1031.....	Blue silty limestone.....	Road at first quarry north of Wrightsville; from over tunnel connecting two quarries.
1032.....	Sandy slate.....	South end of Wrightsville, near Creitz creek.
1033.....	Sandy slate.....	One-fourth of a mile south of Wrightsville.
1034.....	Sand or crystalline schist, with prints of pyrite crystals.....	One-half mile south of Wrightsville.
1035.....	Sandy slate.....	Three-fourths of a mile south of Wrightsville.
1036.....	Slate .....	Three-fourths of a mile south of Wrightsville, H. Wilton's property.
1037.....	Quartz conglomerate.....	Three-fourths of a mile south of Wrightsville.
1038.....	Argillite.....	One mile south of Wrightsville, Wilton's run, at old cabin.
1039.....	Finely laminated argillite .....	One mile south of Wrightsville, Wilton's run, at old cabin.
1040.....	Quartz slate with prints of pyrite crystals.....	One mile south of Wrightsville.
1041.....	Hydro-mica (?) slate.....	One and one-eighth miles south of Wrightsville.
1042.....	Hydro-mica (?) slate .....	Slate quarry, $1\frac{1}{4}$ miles south of Wrightsville.
1043.....	Hydro-mica (?) slate .....	One and a half mile south of Wrightsville.
1044.....	Decomposed sandy schist .....	Two miles south of Wrightsville.
1045.....	Decomposed sandy schist .....	Two and a quarter miles south of Wrightsville.
1046.....	Argillite.....	Two and a half miles south of Wrightsville.
1047.....	Blue limestone.....	Opposite timber yard at Creitz creek, south end of Wrightsville.
1048.....	Crystalline schist.....	Opposite mouth of Creitz creek.
1049.....	Bluish dolomite (?) .....	Opposite mouth of Creitz creek.
1050.....	Dolomite.....	

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
1051 .....	Crypto cryst. schist.....	One-fourth mile south of Wrightsville, at canal lock.	
1052 .....	Calc. slate (?) with seam of calcite.....	One-fourth mile south of Wrightsville, at canal lock.	
1053 .....	Slaty limestone .....	Near Wilson's quarry, south of Wrights- ville.	
1054 .....	Conglomeratic limestone.....	Quarry, north-west end of Wrights- ville.	
1055 .....	Orthofelsite .....	One-fourth mile north of road to Le- rew's store.	
1056 .....	Variegated chlorite schist.....	Three and a half miles south-east of Boiling Springs, Cumberland county.	
1057 .....	Slaty orthofelsite.....	One-third mile from cross-roads to Le- rew's store.	
1058 .....	Quartz conglomerate.....	Four miles from Boiling Springs, Cumber- land county.	
10.9 .....	Variegated chlorite schist .....	Three and a half miles south-east of Boiling Springs.	
103.) .....	Asbestos, quartz, and specular iron ore ..	Four and a half miles north of Peters- burg.	
1061 .....	Crystalline schist stained with iron.....	Four miles south-east of Boiling Springs.	
1062 .....	Jaspery orthofelsite .....	Three miles north of Petersburg.	
1063 .....	Weathered chlorite slate with quartz ..	Four miles north-east of Mt. Holly Springs.	
1064 .....	Mountain Creek rock.....	Three miles south-east of Boiling Springs.	
1065 .....	Sandy clay slate.....	Four and a half miles north of Peters- burg.	
1066 .....	White quartzite .....	Three miles south-east of Boiling Springs.	

1067 .....	Sandstone containing layers of schist.....	Two and a half miles south-east of Bolling Springs.	Mountain Creek rock.
1068 .....	Quartz .....	Four miles north of Petersburg.	
1069 .....	Hydro-mica conglomerate .....	Two and a half miles south-east of Bolling Springs.	
1070 .....	Steatite .....	Peach Bottom.	
1071 .....	Red quartzite .....	Two miles north-east of Mummasburg.	
1072 .....	Argillaceous sandstone .....	One mile south of Arendtsville.	
1073 .....	Quartzite .....	North-west end of Arendtsville.	
1074 .....	Orthofelsite .....	One mile north-west of Arendtsville.	
1075 .....	Weathered orthofelsite slate .....	One fourth mile north-west of Arendtsville.	
1076 .....	Slaty orthofelsite .....	One-fourth mile north-west of Arendtsville.	
1077 .....	Slaty orthofelsite .....	One and three-fourths miles north-west of Arendtsville.	
1078 .....	Jaspery orthofelsite .....	One and three-fourths miles north-west of Arendtsville.	
1079 .....	Clay slate .....	Three and a half miles north-west of Arendtsville.	
1080 .....	Orthofelsite .....	Three and a half miles north-west of Arendtsville.	
1081 .....	Orthofelsite, with vein of epidote.....	One-fourth mile north-west of Stewart's. Shippensburg road.	Mountain Creek rock.
1082 .....	Orthofelsite slate.....	One mile north-west of Stewart's. Shippensburg road.	
1083 .....	Schist containing quartz pebbles.....	One-half mile north-west of school-house, near Stewart's.	
1084 .....	Coarse schist conglomerate .....	Near school-house, $\frac{1}{2}$ mile beyond Stewart's, Shippensburg road.	Mountain Creek rock.
1085 .....	Schist intersected by quartz veins .....	One-half mile north-west of same school-house.	
1086 .....	Schist with quartz fragments.....	Summit of Piney Hill. Shippensburg road.	Mountain Creek rock.
1087 .....	Schist with quartz pebbles.....	One-fourth mile north-west of summit of Piney Hill.	Mountain Creek rock.
1088 .....	Hydro-mica schist.....	Near Beamer's private road on Shippensburg road.	

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber of spe- cimen.	Character	Locality	Remarks.
1089.....	Hydro-mica slate, with amethyst frag- ments.	Two miles north-west of Stewart's, Ship- penburg road.	Mountain Creek rock.
1090.....	Argillite.....	Near Beamer's mill.	
1091.....	Hydro-mica and pebbles.....	Near Summit mountain, north-west of Beamer's.	Mountain Creek rock.
1092.....	Laminated quartz conglomerate .....	Near Summit mountain, north-west of Beamer's.	
1093.....	Blue mud-rock .....	Two miles south-east of Gettysburg, Baltimore pike.	
1094.....	Bluish sandstone, with epidote .....	Two miles south-east of Gettysburg, Baltimore pike.	
1095.....	Reddish sandstone.....	Two and a quarter miles south-east of Gettysburg, Baltimore pike.	
1096.....	Laminated red sandstone .....	Two and a quarter miles south-east of Gettysburg, Baltimore pike.	
1097.....	Argillaceous red sandstone .....	Three miles south-east of Gettysburg, Baltimore pike.	
1098.....	Orthofelsite .....	Three miles north-west of Arendtsville. One-half mile north-west of Cole's saw mill, Shippensburg road.	
1099.....	Sandy Chlorite schist.....	Three and three-fourths miles west by north of Arendtsville.	Missing.
1100.....	Finely laminated orthofelsite .....	Four miles west by north of Arendts- ville.	
1101.....	Decomposed schist.....	Four miles west by north of Arendts- ville.	
1102.....	Decomposed orthofelsite .....	Four miles west by north of Arendts- ville.	
1103.....	Slaty orthofelsite .....	Four and a quarter miles north-west of Arendtsville.	
1104.....	Felsitic slates .....	Four and a quarter miles north-west of Arendtsville.	

1105.....	Green chlorite schist .....	Four and a half miles west by north of Arendtsville.
1103.....	Felsitic slates.....	Four and half miles west by north of Arendtsville.
1107.....	Slaty orthofelsite.....	Four and a half miles west by north of Arendtsville.
1108.....	"Jasper" (compact orthofelsite).....	Missing.
1109.....	Orthofelsite porphyry.....	One-fourth mile east by south of Stewart's, on Shippensburg road.
1110.....	Epidote rock (?) .....	One-fourth mile east by south of Stewart's, on Shippensburg road.
1111.....	Slaty orthofelsite.....	One-eighth mile east by south of Stewart's, on Shippensburg road.
1112.....	Trap (?) .....	Five miles west by north of Arendtsville.
1113.....	Conglomerate schist, quartz pebbles, amethyst color.	Five and one-eighth miles west by north of Arendtsville.
1114.....	Hydro-mica schist .....	One-half mile beyond Stewart's, Shippenburg road.
1115.....	Purplish quartzose schist.....	Three-fourths of a mile beyond Stewart's, Shippensburg road.
1116.....	Conglomerate schist, coarse, quartz pebbles.	Three-fourths of a mile beyond Stewart's, Shippensburg road.
1117.....	Quartzite .....	One and a half miles beyond Stewart's, Shippensburg road.
1118.....	Argillite .....	Two and one-eighth miles beyond Stewart's, Shippensburg road.
1119.....	Sandy hydro-mica schist.....	One-fourth mile beyond Beamer's, Shippensburg road.
1120.....	Greenish schist, with amethyst-colored pebbles.	Three-fourths of a mile beyond Beamer's, Shippensburg road.
1121.....	Red quartzose schist .....	One mile east of county line, Shippensburg road.
1122.....	Quartzite .....	One mile east of county line, Shippensburg road.
1123.....	Honey-combed clay slate .....	Stewart's farm, on Shippensburg road.
1124.....	Purplish quartzose schist .....	Summit Piney Hill.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field num- ber of spec- imen.	Character.	Locality.	Remark.
1125.....	Hydro-mica schist.....	Summit Piney Hill, near Cole's saw and stave mill.	
1126.....	Orthofelsite porphyry .....	Near Cole's saw and stave mill.	
1127.....	Epidote rock.....	Piney Hill, near Cole's saw and stave mill.	
1128.....	Trap.....	Four miles south of Gettysburg. Emmitsburg road.	
1129.....	Weathered orthofelsite porphyry .....	Five miles south of Gettysburg. Emmitsburg road.	
1130.....	Jaspery orthofelsite (?) .....	Five miles south of Gettysburg. Emmitsburg road.	
1131.....	Trap.....	Four and three-fourths miles south of Gettysburg. Emmitsburg road.	
1132.....	Trap.....	Four and three-fourths miles south of Gettysburg. Emmitsburg road.	
1133.....	Orthofelsite .....	Four and a half miles south of Gettysburg. Emmitsburg road.	
1134.....	Fine-grained trap .....	Four miles south of Gettysburg. Emmitsburg road.	
1135.....	Rounded pebble of trap .....	Four and a half miles south of Gettysburg. Emmitsburg road.	
1136.....	Mud-rock resembling orthofelsite .....	Willinghby Run bridge.	
1137.....	Trap of alteration (?) .....	Two miles north of Emmitsburg.	
1138.....	Ferriferous trap .....	Two miles north of Emmitsburg.	
1139.....	Trap .....	Two miles north of Emmitsburg.	
1140.....	Altered orthofelsite porphyry (?) .....	Two miles north-east of Emmitsburg.	
1141.....	Decayed trap .....	Two miles north-east of Emmitsburg.	
1142.....	Compact argillaceous gray sandstone .....	Two miles north-east of Emmitsburg.	
1143.....	Milaceous ore in sandy shale .....	G. Kriese's farm, 2½ miles from Emmitsburg.	

1144.....	Calcite, pyrite, chalcopyrite and micae-	G. Krise's farm, $2\frac{1}{2}$ miles from Emmitts-
1145.....	ceous ore.	burg.
Shale, with coating of micaceous ore and	pyrite.	G. Krise's farm, $2\frac{1}{2}$ miles from Emmitts-
1146.....	Banded shale .....	burg.
1147.....	Occurrence of micaceous ore.....	G. Krise's farm, $2\frac{1}{2}$ miles from Emmitts-
1148.....	Orthofelsite porphyry, with greenish base,	burg.
1149.....	Slaty orthofelsite.....	Cole's saw and stave mill, 3 miles north
1150.....	Schistose conglomerate, amethyst peb-	of Chambersburg pike.
bles.	bles.	
1151.....	Orthofelsite	Newman's, Chambersburg pike.
1152.....	Talc. (?) schist.....	Mountain side north-west of Newman's.
1153.....	Epidote (?) rock.....	At Newman's, $\frac{1}{4}$ miles north of Cham-
1154.....	Crystalline epidote rock (?) .....	bersburg pike.
1155.....	Greenish schist.....	Two miles north of Chambersburg pike.
1156.....	Conglomeratic schist .....	Two miles north of Chambersburg pike.
1157.....	Quartzite .....	Two and a half miles north of New-
1158.....	Quartzose schist .....	man's.
1159.....	Very quartzose schist .....	Three miles north of Newman's.
1160.....	Quartzite .....	One and a quarter miles south of west
1161.....	Greenish sandstone.....	of burned saw mill on Conocoheague.
1162.....	Sandy blue shale.....	One and a half miles south of west of
1163.....	Red shale.....	burned saw mill on Conocoheague.
1164.....	Quartzito.....	Three and a half miles north of Cale-
		dona Furnace, Birch creek.
		Three miles north of Caledonia Furnace,
		Birch creek.
		Three miles west of Gettysburg. Cham-
		bersburg pike.
		Three and a half miles west of Gettys-
		burg. Chambersburg pike.
		Four miles west of Gettysburg. Cham-
		bersburg pike.
		Junction of Birch and Conocoheague
		creeks, 3 miles north of Caledonia Fur-
		nace.

## CATALOGUE OF SPECIMENS--CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
1165.....	Orthofelsite .....	One-fourth mile south-east of Caledonia Furnace.	
1166.....	Quartz conglomerate polished on one surface.	One-half mile east of Graffenburg, on pike.	
1167.....	Laminated orthofelsite .....	One-fourth mile south-east of Caledonia Furnace.	
1168.....	Fine-grained compact orthofelsite, (not porphyritic.)	One-fourth mile south-east of Caledonia Furnace.	
1169.....	Fine-grained compact orthofelsite, not porphyritic.	One and a half miles south-east of Caledonia Furnace.	
1170.....	Fine-grained compact orthofelsite (slaty.)	Three and a half miles south-east of Caledonia Furnace.	
1171.....	Weathered orthofelsite (porphyritic) ....	Three and a half miles south-east of Caledonia Furnace.	
1172.....	Weathered orthofelsite (porphyritic) ....	Three and three-fourths miles south-east of Caledonia Furnace.	Missing.
1173.....	Orthofelsite with epidote (?) .....	On road from pike at furnace, $\frac{1}{4}$ mile north of Mont Alto. Fairfield road near Baker's.	
1174.....	Red and white banded quartzite .....	One-fourth mile north-east of Caledonia Springs.	
1175.....	Weathered quartzite, interstreaked red and white.	One mile north-east of Caledonia Springs.	
1176.....	Laminated quartzite, with specks of manganous ore.	One mile north-east of Caledonia Springs.	
1177.....	Sandy slate.....	Two and a half miles north-east of Caledonia Springs.	
1178.....	Orthofelsite .....	Three miles north-east of Caledonia Springs.	
1179.....	Blue and white orthofelsite, (porphyritic.)	Road to Chambersburg pike from Caledonia Springs.	

1180	Conglomerate schist.....	Summit Notch, 2 miles north-east of Reamer's tavern.	Mountain Creek rock.
1181	Conglomerate schist.....	Summit Notch, 2 miles north-east of Reamer's tavern.	Mountain Creek rock.
1182	Pink quartzite.....	Three miles north-east of Caledonia Furnace.	Mountain Creek rock.
1183	Schistose conglomerate .....	Three and one-fourth miles north-east of Caledonia Furnace.	Mountain Creek rock.
1184	Finely laminated felsite mass, with quartz pebbles.	Two and a half miles north-east of Caledonia Furnace.	
1185	Orthofelsite with irregular cleavage .....	One mile south-west of Newman's, Road to Newman's from Caledonia Springs. One-half mile from Caledonia Springs.	
1186	Weathered orthofelsite porphyry, light pink tinge .....	At "Summit," on Chambersburg pike.	
1187	Weathered orthofelsite porphyry, light pink tinge .....	Newman's, Chambersburg pike.	
1188	Talose schist, weathered.....	Newman's, Chambersburg pike.	
1189	Laminated talose orthofelsite .....	Near Newman's.	
1190	Green sandy schist.....	Chambersburg pike, 14 miles west of Gettysburg.	
1191	Gray quartzite .....	Two and a half miles north-east of Newman's.	
1192	Hydro-mica slate.....	Coler's farm, 1 mile north-east of Newman's.	
1193	Specular ore in orthofelsite .....	Coler's farm, 1 mile north-east of Newman's.	
1194	Specular ore in orthofelsite .....	One hundred feet north of west of Shepard's house, and 1 mile north-east of Newman's.	
1195	Slaty orthofelsite porphyry .....	Three-fourths of a mile west of Newman's, on Chambersburg pike.	
1196	Finely laminated porphyritic orthofelsite.	One mile west of Newman's, Chambersburg pike.	
1197	Schistose conglomerate .....	One and a quarter miles east of Gräffenburgh, on pike.	
1198	Orthofelsite porphyry.....	Grafenburgh Springs, 10½ miles west of Gettysburg.	Mountain Creek rock.
1199	Quartzose schist (?) .....	Caledonia village, 1 mile west of Graßfenning.	
1200	Quartzite.....		

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'snal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
1201.....	Orthofelsite porphyry.....	One and a quarter miles east of Graefenburg. South of saw mill on pike.	
1202.....	Orthofelsite .....	One-half mile east of south of pike, on road to charcoal pits near Caledonia Springs road.	
1203.....	Weathered orthofelsite, partly porphyritic.	One and a half miles south of saw mill, 1½ miles east of Graefenburg.	
1204.....	Orthofelsite .....	Three-fourths of a mile east of Graefenburg.	
1205.....	Sandy green (epidote?) rock .....	Three-eighths of a mile east of Graefenburg.	Missing.
1206.....	Limonite .....	One and a half miles north-west of Greenwood. Road to Scotland.	
1207.....	Float ore (limonite) .....	S. Wolf's farm, 2 miles north-west of Greenwood.	
1208.....	Impure limonite .....	S. Wolf's farm, 2 miles north-west of Greenwood, from shaft.	
1209.....	Limonite .....	Rawson's farm, 2 miles north-west of Greenwood.	Missing.
1210.....	Quartzite .....	Two and a half miles north-west of Greenwood.	Missing.
1211.....	Quartzite sandstone and conglomerate .....	Three miles north-west of Greenwood.	
1212.....	Pulverulent sandstone .....	Three miles north-west of Greenwood.	
1213.....	Quartzose sandstone, with <i>scotia</i> .....	Caledonia village, 1 mile east of Greenwood.	
1214.....	Quartzite .....	Three and a half miles north-west of Greenwood.	
1215.....	Quartzose sandstone, with <i>scotia</i> .....	Four miles north-west of Greenwood.	
1216.....	Quartzose sandstone, with spangles of micaceous iron.	Three-fourths of a mile north-east of Tam's nail. Cold Spring road.	
1217.....	Quartzite .....	Four miles north of Fayetteville.	

1218.....	Limonite .....	M. Good's farm, $1\frac{1}{2}$ miles north of Fayetteville.
1219.....	Limonite .....	M. Good's farm, $1\frac{1}{2}$ miles north of Fayetteville, shaft.
1220.....	Limonite, with red ochre .....	M. Good's farm, $1\frac{1}{2}$ miles north of Fayetteville, one bank.
1221.....	Fibrous limonite .....	M. Good's farm, $1\frac{1}{2}$ miles north of Fayetteville, one bank.
1222.....	Marcellary hematite .....	M. Good's farm, $1\frac{1}{2}$ miles south-east of Fayetteville, one bank, "English bank," 2 miles south-east of Greenwood.
1223.....	Brown and pink quartzite.....	One and a half mile north-east of Kean's saw mill.
1224.....	Quartzite .....	Cold Spring road, 1 mile south-east of Greenwood.
1225.....	Quartz conglomerate.....	Cold Spring road, 1 mile south-east of Greenwood.
1226.....	Impure limonite .....	Pond bank, 2 miles south-east of Greenwood.
1227.....	Quartz conglomerate, cemented by iron oxide.	Pond bank, 2 miles south-east of Greenwood.
1228.....	Limonite ore .....	"English bank," 2 miles south-east of Greenwood.
1229.....	Cretaceous hematite and red ochre .....	Caledonia bank, 2 miles south-east of Greenwood.
1230.....	Efusian limestone .....	Two miles south-east of Greenwood, near Pond bank.
1231.....	Limestone .....	Two miles south-east of Greenwood, near Pond bank.
1232.....	Quartzose sandstone .....	Two miles south-east of Greenwood, near Pond bank.
1233.....	Red sandy shale .....	Four miles from Gettysburg, Baltimore pike.
1234.....	Fine-grained yellowish-green sandstone.	Four miles south of Gettysburg, Baltimore pike.
1235.....	Laminated yellowish-green shale .....	Four and a half miles south of Gettysburg, Baltimore pike.
1236.....	Laminated greenish sandy shale .....	Four and three-fourths miles south of Gettysburg, Baltimore pike.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provis'nal field num- ber of spe- cimen.	Character.	Locality.	Remarks.
1237.....	Laminated greenish sandy shale.....	Four and three-fourths miles south of Gettysburg. Baltimore pike.	
1238.....	Red sandstone .....	Four and three-fourths miles south of Gettysburg. Baltimore pike.	
1239.....	Purplish-gray sandstone.....	Four and seven-eighths miles south of Gettysburg. Baltimore pike.	
1240.....	Fine-grained argillaceous sandstone, reddish.	One-half mile south of "Two Taverns". Baltimore pike.	
1241.....	Red shale .....	One-fourth mile west of New Salem. Chambersburg pike.	
1242.....	Bluish compact orthofelsite .....	Eleven and three-fourths miles west of Gettysburg. Chambersburg pike.	
1243.....	Orthofelsite containing epidote (?) .....	Eleven and three-fourths miles west of Gettysburg. Chambersburg pike.	
1244.....	Laminated orthofelsite porphyry .....	One-half mile west of Willow Grove tavern. Chambersburg pike.	
1245.....	Varieties of epidote rock .....	Willow Grove. Chambersburg pike.	
1246.....	Light green orthofelsite porphyry .....	Nine and a half miles west of Gettys- burg. Chambersburg pike.	
1247.....	Stony orthofelsite .....	One-half mile west of Cashtown. Cham- bersburg pike.	
1248.....	Quartzose greenish cryst. schist with quartz.	One-half mile west of Cashtown. Crest of mountain.	
1249.....	Sandstone with mica .....	One-half mile west of Cashtown. Crest of mountain.	
1250.....	Chlorite schist with amethyst peb- bles.	Hanzelman's hotel, Cashtown.	
1251.....	Quartzite .....	Crest of mountain, opposite Pond bank. "White Rock".	
1252.....	Quartz conglomerate.....	Three miles north-east of Funkstown.	
			Mountain Creek Rock.

1263.....	Chlorite schist with pebbles of amethyst color.....	Hanzelman's hotel, Cashtown
1234.....	Pure limonite.....	Three miles north-east of Funkstown. Mountain road from Greenwood.
1235.....	Translucent slaty quartzite.....	Three miles north of Mont Alto.
25 1236.....	Milk-white quartzite, of peculiar texture and fracture.....	Two miles north of Mont Alto. One mile north of Mont Alto Furnace.
1237.....	Quartz conglomerate.....	Bank No. 1, 1 mile north of Mont Alto.
1238.....	Chert.....	Bank No. 1, 1 mile north of Mont Alto.
1239.....	Concentric layers of limonite and clay.....	One and a quarter miles north of furnace.
1240.....	Trap (?).....	One mile north of Mont Alto Furnace.
1241.....	Buff-colored dolomitic conglomerate.....	One and a half miles south-east Mt. Alto Furnace.
1242.....	Purplish slaty orthofelsite.....	One-half mile east of furnace.
1243.....	Quartzite with scolithus (?).....	"Narrows," 1 mile east of Mt. Alto Furnace.
1244.....	Quartzite.....	Two and a quarter miles east of Mont Alto Furnace.
1245.....	Greenstone (diabase ?).....	Two miles east of Mont Alto Furnace.
1246.....	Orthofelsite porphyry.....	Summit Ridge east of narrow, $\frac{1}{4}$ miles east of furnace.
1247.....	Dolerite.....	Three miles east of furnace.
1248.....	Fine-grained rock, melaphyre (?).....	Three miles east of furnace.
1249.....	Compact green rock, melaphyre (?).....	One fourth mile east of Mont Alto office.
1250.....	Conglomerate, with amethyst fragments.....	Fairfield road.
1271.....	Greenstone (?).....	Two miles east of Mont Alto office.
1272.....	Quartzite containing crystals of iron pyrites.....	Fairfield road One-half mile east of south of Caledonia Springs. Fairfield road.
1273.....	Conglomeratic schist, with amethyst pebbles.....	East side of crest of Green Ridge, 1 mile south-east of springs.
1274.....	Lead-colored crystalline schist.....	East side of crest of Green Ridge, 1 mile south-east of springs.
1275.....	Green sandy slate, epidote (?).....	Baker's, 1 mile west of Caledonia Springs.
1276.....	Quartzite.....	Caledonia Springs.

Mountain Creek creek.

## CATALOGUE OF SPECIMENS—CONTINUED.

Prov'slal field num- ber of spe- cimen.	Character	Locality.	Remarks.
1277.....	Argillite .....	One and a quarter miles south-east of Caledonia springs.	Mountain Creek rock.
1278.....	Conglomerate of quartz pebbles.....	One and a half miles east of Caledonia springs.	
1279.....	Epidote rock.....	One and a half miles east of Caledonia springs.	
1280.....	Clay slate .....	One-fourth mile west of Bingham's Fairfield road.	Mountain Creek rock.
1281.....	Conglomerate schist.....	Three-fourths of a mile west of Bingham's Fairfield road.	
1282.....	Orthofelsite porphyry .....	Two and a quarter miles east of Caledonia Springs.	
1283.....	Hydro-mica schist .....	Two and a quarter miles east of Caledonia Springs.	
1284.....	Compact felsite rock, with Jasper-like fracture.	Three miles east of south of Caledonia Springs.	
1285.....	Fibrous quartz in epidote rock.....	Baker's house, 2½ miles east of Caledonia springs.	
1286.....	Orthofelsite porphyry .....	Three miles east of Caledonia springs.	
1287.....	Brownish granular limestone.....	One and a half miles north of Fairfield.	
1288.....	Epidote rock.....	Three miles east of Caledonia Springs.	
1289.....	Epidote rock.....	Three miles east of Caledonia Springs.	
1290.....	Epidote rock.....	Three and a quarter miles east of Caledonia Springs.	
1291.....	Epidote rock.....	Four miles east of Caledonia Springs.	
1292.....	Argillite.....	Three and a quarter miles east of springs.	
1293.....	Coarse-grained trap .....	One-half mile west of Gettysburg. Fairfield road.	
1294.....	Trap.....	Six miles west of Gettysburg, and 1½ miles east of north of Fairfield.	

1295.....	Magnetic sand.....	Two miles east of north of Fairfield. Gettysburg road.
1296.....	Trap.....	Seminary Ridge, (railroad cut,) Gettysburg.
1297.....	Trap.....	School House Ridge, $2\frac{1}{4}$ miles west of Gettysburg. Chambersburg pike.
1298.....	Argillaceous sandstone, charged with epidote.	Three and a quarter miles west of Gettysburg. Chambersburg pike.
1299.....	Compact greenish sandstone.....	Three and a half miles west of Gettysburg. Chambersburg pike.
1300.....	Calcareous conglomerate.....	One and a quarter miles north-west of New Salem. Road to Minter mine. Fields of Mr. Confort. Shaft at Confort's.
1301.....	Impure iron ore .....	Dump heap.
1302.....	Magnetic ore .....	One and a quarter miles east of Two Taverns. Baltimore pike.
1303.....	Varieties of rock occurring in Minter mine .....	Two and a half miles north of Littlestown.
1304.....	Fine-grained argillaceous sandstone .....	Two miles north of Littlestown.
1305.....	Yellowish-green sandstone .....	One mile north of Littlestown.
1306.....	Coarser-grained, yellowish-green on-gneiss.....	Sabot House Ridge, $2\frac{1}{4}$ miles west of Gettysburg. Chambersburg pike.
1307.....	Red shale with spangles (mica?) .....	One and a half miles north-east of York. Jessie Group, Huntingdon township, Adams county.
1308.....	Compact green sandstone .....	Z. Louck's ore bank, near York.
1309.....	Dark sandy limestone slate .....	Look. Susquehanna river, below Wrightsville.
1310.....	Ore (slightly magnetic) .....	Wister's Furnace, Harrisburg.
1311.....	Magnetic wash ore .....	Wister's Furnace, Harrisburg.
1312.....	Calcareous slates and limestone .....	Kautz's farm, 2 miles north-west of Dillsburg.
1313.....	Phlange of pig .....	Baer's farm, Adams county, (1874).
1314.....	Pig .....	Baer's farm.
1315.....	Bessemer pig .....	Beer's farm.
1316.....	Iron-ton paint .....	Beer's farm.
1317.....	Compact chlorite slate .....	
1318.....	Quartz in ferruginous clay .....	
1319.....	Chlorite with pyrite .....	

## CATALOGUE OF SPECIMENS—CONTINUED.

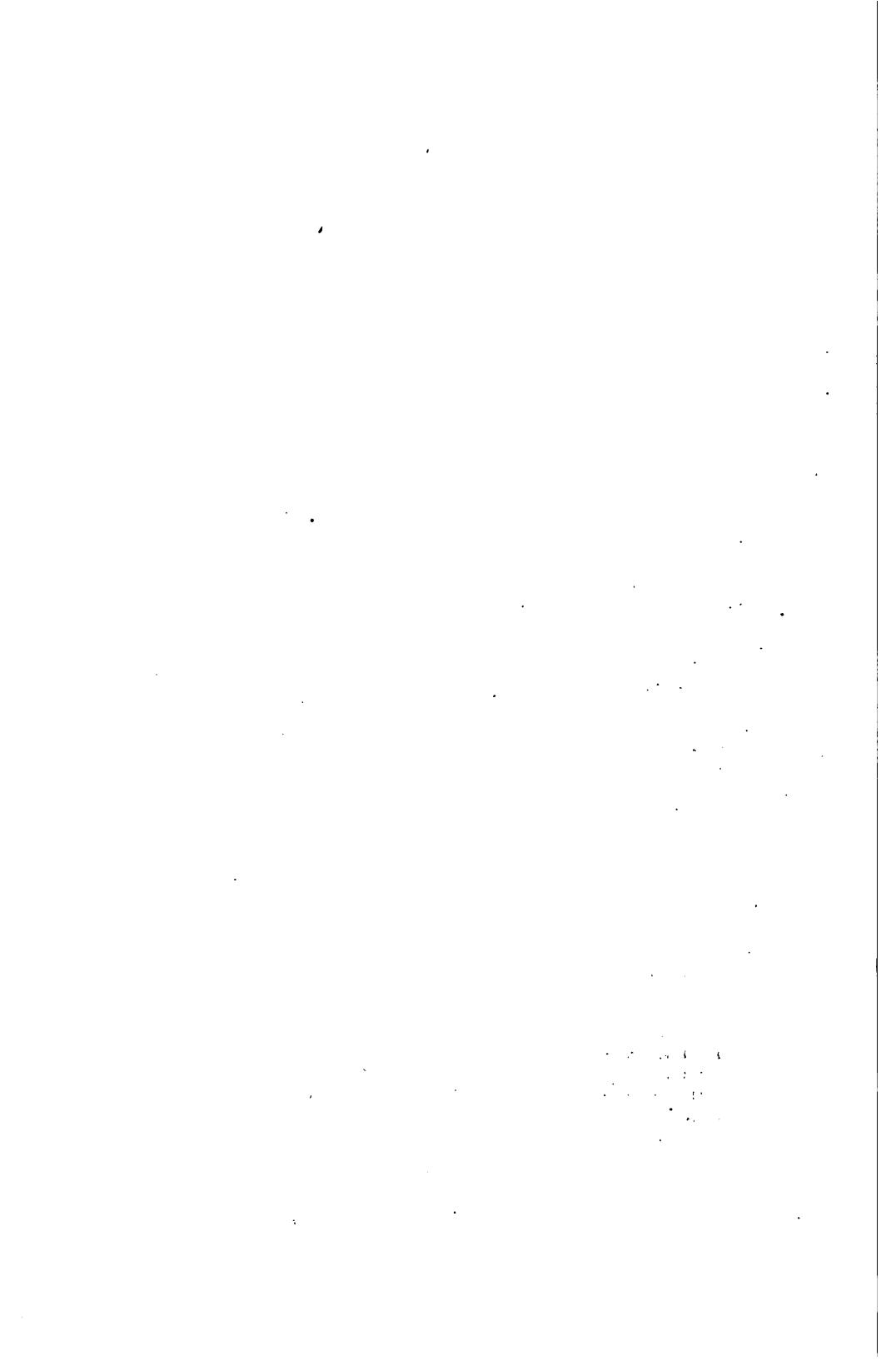
Prov'snal field num. or number of speci- mens.	Character.	Locality.	Remarks.
1320.....	Clay slate.....	Baer's farm,	
1321.....	Chlorite slate stained with and iron pyrites.....	Baer's farm.	
1322.....	Pyriles in chlorite slate .....	Baer's farm.	
1323.....	Clay slate .....	Kunkel's farm, 1 mile south-east of Lititztown.	
1324.....	White feldspathic trap.....	Tanertown road, 1½ miles south of Gettysburg.	
1325.....	Ribbed trap.....	Summit Granite Spur, ¾ miles south of Gettysburg.	
1326.....	Specular iron in quartz.....	Chickies Rock, at Columbia.	
1327.....	Sandstone.....	Near Wrightsville.	
1328.....	Argillite .....	Near Wrightsville.	
1329.....	Hydro-mica slate.....	Near Wrightsville.	
1330.....	Fine-grained chlorite slate .....	Near Wrightsville.	
1331.....	Compact chlorite slate with pits of pyrite.	Second stop-lock south of Wrightsville.	
1332.....	Sandy slate .....	Two miles north of Wrightsville.	
1333.....	Sandy slate .....		
1334.....	Hydromica slate .....	Bull's Run, south of Wrightsville.	
1335.....	Quartzite .....	Sharp bend in road opposite Chickies.	
1336.....	Sandy crystalline limestone .....	Junction of limestone and sandstone, north of Wrightsville.	
1337.....	Compact crystalline slate.	Near Wrightsville.	
1338.....	Hydro-mica slate .....	Near Wrightsville.	
1339.....	Artiferous slate .....	Near Wrightsville.	
1340.....	Calcareous sandy slate .....	Canal-tow, below Wrightsville.	
1341.....	Calcareous slate .....	Dettweiler's quarry, 4½ miles south of Wrightsville.	
1342.....	Dolomitic conglomerate .....	West bank of Cretz creek, 200 yards from bridge.	
1343.....	Sandy crystalline slates .....	Lock house.	

1344.....	Coarse-grained trap.....	Near Fairfield. 1½ miles east of north
1345.....	Trap.....	Three miles north of Rossville, on old road to Dillsburg.
1346.....	Fine-grained sandstone.....	Three miles north of Rossville, on old road to Dillsburg.
1347.....	Trap.....	Three and a quarter miles north of Rossville, on old road to Dillsburg.
1348.....	Trap.....	Three and a half miles north of Rossville, on old road to Dillsburg.
1349.....	Trap.....	Four miles north of Rossville, on old road to Dillsburg.
1350.....	Trap.....	Four miles north of Rossville, on old road to Dillsburg.
1351.....	Trap.....	Three and a half miles south-east of Dillsburg, on old road to York.
1352.....	Trap.....	Three and a quarter miles south of east of Dillsburg, on old road to York.
1353.....	Grayish sandstone.....	Three and a quarter miles east of Dillsburg.
1354.....	Trap.....	Two and a half miles east of Dillsburg.
1355.....	Greenish sandstone.....	Two and a half miles east of Dillsburg, opposite Price's bank.
1356.....	Greenish sandstone.....	Two and a half miles east of Dillsburg, opposite Price's bank.
1357.....	Greenish sandstone.....	Pit near south-west end of McCormick's long out, 1 mile east of Dillsburg.
1358.....	Trap.....	King's mine, 2 miles east of Dillsburg.
1359.....	Sandstone.....	King's mine, 2 miles east of Dillsburg, (top and bottom rock.)
1360.....	Trap.....	Foot of slope, King's mine.
1361.....	Limonite.....	Williams' bank, 2½ miles south-west of Dillsburg.
1362.....	Trap.....	Near Underwood's mine. In field south of new opening.
1363.....	Greenish sandstone.....	Near Underwood's mine. In field south of new opening.
1364.....	Magnetic ore.....	King's mine, 2 miles east of Dillsburg.

## CATALOGUE OF SPECIMENS—CONTINUED.

Provisional field num- ber of spec- imens.	Character.	Locality.	Remarks.
1320.....	Clay slate.....	Baer's farm.	
1321.....	Chlorite slate stained with and iron py- rites.....	Baer's farm.	
1322.....	Pyrates in chlorite slate.....	Baer's farm.	
1323.....	Clay slate.....	Kunkel's farm, 1 mile south-east of Lit- tlestown.	
1324.....	White feldspathic trap.....	Taneytown road, 1½ miles south of Gettysburg.	
1325.....	Ribbed trap.....	Summit Granite Spur, 3½ miles south of Gettysburg.	
1326.....	Specular iron in quartz.....	Chickies Rock, at Columbia.	
1327.....	Sandstone.....	Near Wrightsville.	
1328.....	Argillite.....	Near Wrightsville.	
1329.....	Hydro-mica slate.....	Near Wrightsville.	
1330.....	Fine-grained oniorite slate.....	Near Wrightsville.	
1331.....	Compact chlorite slate with pits of pyrite.	Second stop-lock south of Wrightsville.	
1332.....	Sandy slate.....	Two miles north of Wrightsville.	
1333.....	Hydro-mica slate.....	Bull's Run, south of Wrightsville.	
1334.....	Quartzite.....	Sharp bend in road opposite Chickies.	
1335.....	Sandy crystalline limestone.....	Junction of limestone and sandstone, north of Wrightsville.	
1336.....	Compact crystalline slate.....	Near Wrightsville.	
1337.....	Hydro-mica slate.....	Near Wrightsville.	
1338.....	Abligateous slate.....	Near Wrightsville.	
1339.....	Calcareous sandy slate.....	Canal locks, below Wrightsville.	
1340.....	Calderons slate.....	DeWeiser's quarry, 4½ miles south of Wrightsville.	
1341.....	Calderons slate.....	West bank of Cretz creek, 200 yards from bridge.	
1342.....	Dolomitic conglomerate.....	Look house.	
1343.....	Sandy crystalline slate.....		

1344.....	Coarse-grained trap.....	Near Fairfield. 1½ miles east of north of Fairfield.
1345.....	Trap.....	Three miles north of Rossville, on old road to Dillsburg.
1346.....	Fine-grained sandstone.....	Three miles north of Rossville, on old road to Dillsburg.
1347.....	Trap.....	Three and a quarter miles north of Rossville, on old road to Dillsburg.
1348.....	Trap.....	Three and a half miles north of Rossville, on old road to Dillsburg.
1349.....	Trap.....	Four miles north of Rossville, on old road to Dillsburg.
1350.....	Trap.....	Four miles north of Rossville, on old road to Dillsburg.
1351.....	Trap.....	Three and a half miles south-east of Dillsburg, on old road to York.
1352.....	Trap.....	Three and a quarter miles south of east of Dillsburg, on old road to York.
1353.....	Grayish sandstone.....	Three and a quarter miles east of Dillsburg.
1354.....	Trap.....	Two and a half miles east of Dillsburg.
1355.....	Greenish sandstone.....	Two and a half miles east of Dillsburg, opposite Price's bank.
1356.....	Greenish sandstone.....	Two and a half miles east of Dillsburg, opposite Price's bank.
1357.....	Greenish sandstone.....	Pit near south-west end of M' Cormick's long cut, 1 mile east of Dillsburg.
1358.....	Trap.....	King's mine, 2 miles east of Dillsburg.
1359.....	Sandstone.....	King's mine, 2 miles east of Dillsburg, (top and bottom rock.)
1360.....	Trap.....	Foot of slope, King's mine.
1361.....	Limonite.....	Williams' bank, 2½ miles south-west of Dillsburg.
1362.....	Trap.....	Near Underwood's mine. In field south of new opening.
1363.....	Greenish sandstone.....	Near Underwood's mine. In field south of new opening.
1364.....	Magnetic ore.....	King's mine, 2 miles east of Dillsburg.



*List of the boxes in which are stored the specimens collected during the year 1875, with the catalogue numbers of the specimens in each box.*

The boxes in which the specimens for 1875 were packed are painted brown on the ends and are marked

1875
No. —
P. F., JR.
<b>Box 1</b> —376, 377, —, 383, 384, 385, 386, 387, 388, 389, 390, —, 392, 393, 394, —, 396, —, 398, —, 400, 401, 402, 403, 404, 405, 406, 407, —, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, —, 421, 422, 423, 424, 425, 426, 427, 428, 429.
<b>Box 2</b> —431, 432, 433, —, 441, —, 445, —, 447, —, 453, 454, 455, —, 457, 458, 459, —, 462, 463, —, 465, 466, 467, 468, 469, —, 474.
<b>Box 3</b> —481, 482, —, 484, —, 486, 487, 488, 489, 490, —, 493, —, 496, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521.
<b>Box 4</b> —525, 526, 527, 528, —, 530, 531, 532, 533, 534, 535, —, 538, 539, 540, 541, 542, 543, 544, —, 546, 547, —, 549, —, 551, 552, 553, —, 557, 558, 559, 560, 561, 562, 564, 565, 566, —, 568, 569, 570, 571, —, 573, 574, —, 576, —, 578, 579, 580, —, 582, 583, 584.
<b>Box 5</b> —585, 586, 587, 588, 589, —, 591, —, 596, —, 598, 599, —, 601, 602, 603, 604, 605, 606, —, 609, 610, 611, 612, —, 616, 617, 618, 619, 620, 621, 622, 623, —, 626, 627, 628, 629, 630, 631, 632, 633, —, 636, 637, 638, —, 641, 642, 643, —, 646, 647, —, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, —, 665.
<b>Box 6</b> —666, 667, 668, 669, 670, —, 672, 673, —, 675, 676, 677, 678, —, 680, 681, 682, 683, —, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, —, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, —, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, —, 720, 721, 722, 723, 724, 725, 726, —, 728, 729.
<b>Box 7</b> —730, 731, —, 733, 734, —, 736, 737, 738, —, 740, 741, 742, 743, 744, 745, —, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, —, 761, 762, —, 765, 766, 767, —, 769, 770, —, 772, 773, 774, 775, 776, 777, 778, 779, —, 781, —, 783, 784, —, 786, 787, —, 789, —, 791, 792, 793, —, 795.
<b>Box 8</b> —798, —, 800, 801, —, 803, 804, 805, —, 807, 808, 809, —, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, —, 830, 831, 832, 833, 834, —, 836, 837, 838, 839, 840, 841, 842, 843, 844, —, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, —, 867, 868, 869, 870, 871, 872, —, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, —, 892, —, 894, 895, 896, 897, 898, 899, 900, 901, 902.
<b>Box 9</b> —903, 904, 905, 906, —, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, —, 921, 922, 923, —, 925, 926, 927, 928, 929, 930, 931, 932, 934, —, 936, 937, 938, 939, 940, 941, 942, 943, —, 945, 946, 948, 949, 950, —, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976.

- Box 10—977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, —, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, —, 1101, 1102, 1103, 1104, 1105, 1106, 1107, —, 1109, 1110, 1111, —, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, —, 1128, 1129, 1130, —, 1133, —, 1136, —, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150.
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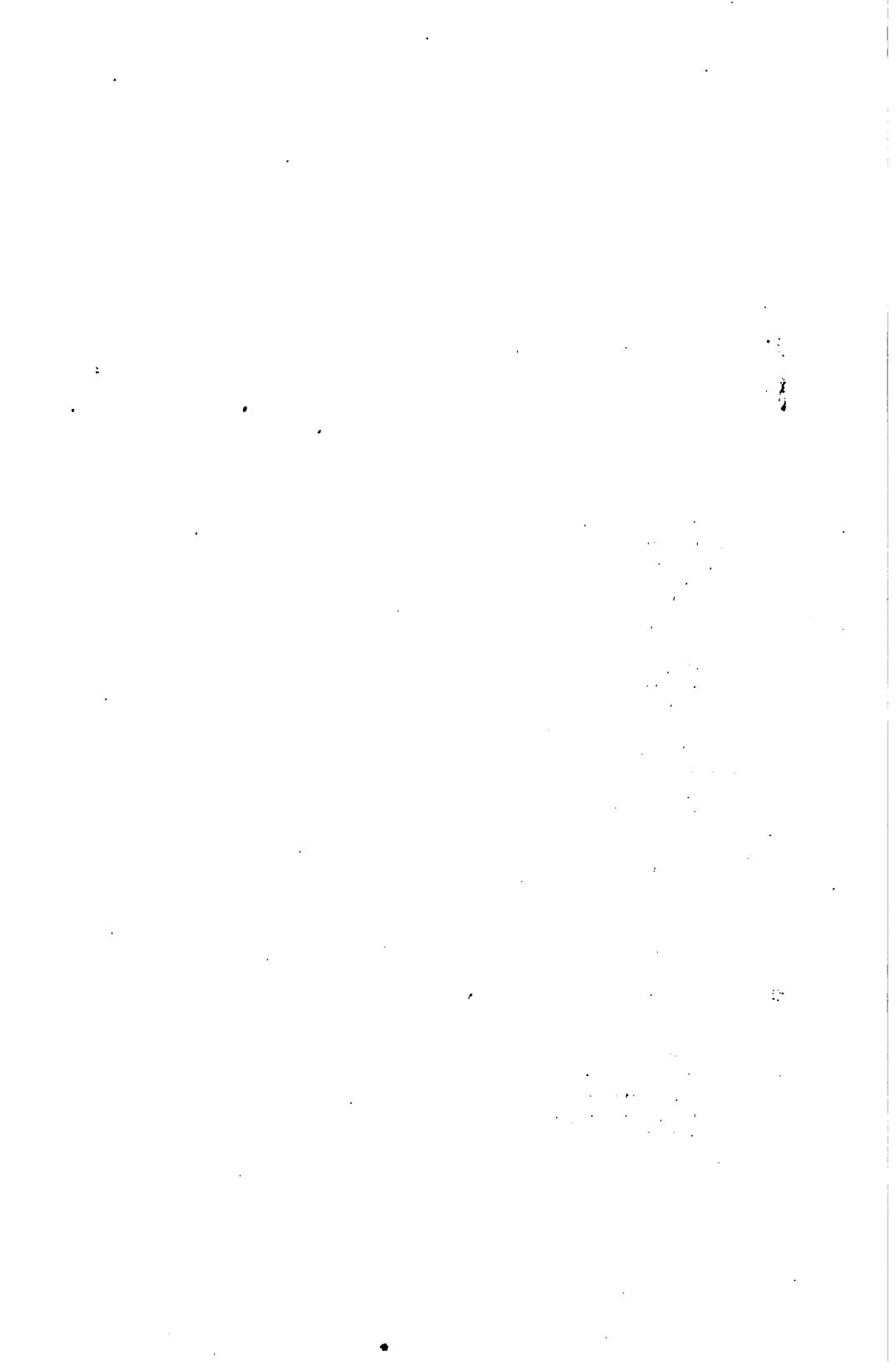
The blanks in the above list are mainly filled by specimens of trap, which have been left out for further study and comparison.

The boxes above named have been sent to the University of Pennsylvania.

## E R R A T A .

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- Page 213, 9th line; for "fault rock" read "foot rock."
- Page 215, foot note; for "50°" read "5°."
- Page 220, 8th line; for "near him" read "near here."
- 4th line from bottom, "p. 74 C" should follow "1874" in foot note.
- Page 230; 1st line of page should be "Cannon's ore pits."
- Page 244, last line; insert "ascribed" before the words "to the."
- Page 265, 2d line; for "Berler's" read "Beeler's."
- Page 266, 3d line from bottom; for "conglomerate" read "conglomerates."
- Page 268, lines 20 and 25; for "Corkson" read "Cookson."
- Page 270, 18th line; for "Heinrichs" read "Heinrich."
- Page 284, 11th and 12th lines from bottom; for "the Auroral limestone" read "the limestone."
- Page 286, insert the following: "On the next succeeding pages will be found a tabular statement of the rocks and their structure, as determined by the data employed in the drawing of this section."
- Page 289, 10th line from bottom, insert a period after "angle."
- 9th line from bottom, for "falls" read "fall."
- Page 294, after "S. 40° E.—85," for "laminated quartz" read "weathered orthofelsite."
- Page 304, after last line insert the following: "Note.—Section 13 was also constructed and its location will be found on the map, but its description will be reserved for another report."
- Page 310; after 2d line insert sub-heading "*Traps.*"
- Page 318, 3d line from bottom; for "in the vein" read "of the vein."
- Page 319, 5th line; for "below day" read "on the slope."
- Page 322, 5th line; for "indura-ted" read "indurated"
- Page 325, 2d line; for "mines" read "mine."
- Page 341, foot of left hand column, transfer 567 and 568.



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